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The Farmer's Digest

Volume 12 August-September, 1948 Number 4

Don't Blame the Bull—Look First at the Hay!

Condensed from the Ohio Farmer

Earl W. McMunn

WHEN cows are slow to settle, don't blame the bull—blame the hay! That's the story coming out of a study of thousands of breeding records of the Northern Ohio Breeders Co-operative Association at Tiffin.

Never, until the coming of artificial breeding, has it been possible to assemble so many breeding records in any one place. And, never before has it been possible to have accurate records of the breeding performance of so many cows.

"I'm going to send this bull to the butcher. My cows are not getting with calf." What cattle breeder has not heard this statement from a disgusted neighbor? Of course that's the first idea to enter a breeder's head. And, sometimes it is the right answer. Some bulls do become sterile. But, in a good many cases, as records of this breeding association show, the trouble is in the nutrition of the cows.

Let's have a look at the record. Max Drake and Alvin Reuwee at the Tiffin breeding association have gone back to 1943 and figured the average conception rate per month for all the cows bred by artificial means. Their conception averages are based upon the number of cows not returning for service at the end of eight and 12-week periods.

The over-all conception average for this association has been good. In fact, it's been as good or better than would be expected with natural breeding. But—when the average conception rate is tabulated by months—one fact stands out. Each year there is a difference of 10 to 15 per cent from the month of highest conception to the month when conception was poorest.

Every year the conception rate

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has been higher during the six months when the cows had pasture and then has tapered off during the winter months. When thousands of cows follow such a regular pattern there must be a good reason. It is not just a matter of chance.

For the explanation let's go to Ohio State University and talk with T. S. Sutton. He is recognized the nation over as an authority in the field of animal nutrition. For years he has studied dairy cows and other animals to find out just what they needed to stay healthy and productive.

Sutton points out that the semen sent out by this association is pretty much the same quality throughout the year. In fact, it is examined carefully before shipment and any that is not good just is not sent. It is logical to conclude, then, that most of this difference in conception rate is caused by the condition of the cow. And, when conception rate is so much better in the summer than the winter, it is logical to conclude that grass is the answer.

Of course we know that good green grass is high in carotene or vitamin A. This is one of the vitamins that is necessary for good reproduction. If legume hay is green enough and leafy enough, it, too, is a good source of vitamin A. But the trouble is that too much of our hay is just not green enough and leafy enough.

Sutton points out that a lot of dairymen have had the experience of going along through the winter with cows failing to breed. Then, after a month or two on pasture there would be no more breeding trouble for that summer. This was simply a case of cows suffering from a deficiency of vitamin A but breeding again as soon as they had built up a fresh reserve from the green grass. That's what is happening in dairy herds all over the state as proved by these records from the Northern Ohio Breeders Association.

If a lot of our dairy cattle breeding troubles are the result of poor nutrition, then just what can we do about it? There are several things, according to Dr. Sutton. In the first place we can provide good pasture for just as long a season as possible. This will build up a reserve supply of vitamin A in the cow that will help get her through the winter. Permanent pastures can be fertilized and limed. Emergency pastures can be provided for the midsummer period when permanent pastures are short.

Then for winter feeding more good green hay is needed. According to Sutton "five pounds per day of U. S. Number 1 extra green, extra leafy hay will supply enough vitamin A for a 1000-

pound cow. It would take 50 pounds of Number 3 hay to meet the vitamin A requirement for the same cow." The answer is obvious. A cow can't eat 50 pounds of hay per day. As a result, if the hay is poor she runs short of vitamin A and breeding troubles begin.

All this leads to the conclusion that haymaking time is one of the most important times of the entire year for the dairyman. It really pays to get the crop cured so it will be extra green and leafy. Here is one place where barn curing is a help.

Another thing to remember—don't get all of your good hay covered up in the bottom of the mow and have to feed poor-quality hay for most of the winter. If you have two mows keep all of the good hay in one where you can feed a little every day with the poorer hay. Remember—five pounds per day will give a cow all the vitamin A she needs—if the hay is good enough.

Grass silage is another way to preserve most of the vitamin A. In fact, next to commercially dried alfalfa it has more of this valuable vitamin than any other cow roughage. A report of the USDA shows that grass silage when fed had about three times as much carotene as barn-cured hay. In the same tests, field-cured hay that had been rained on had lost just about all of its carotene by the time it was fed.

This explains what has happened in some Ohio herds. Manager Drake of the Tiffin Association tells of a dairyman who fed poor-quality hay and had no breeding troubles. Then he added, "But I've been feeding grass silage. Would this make any difference?" In this particular case the grass silage may have supplied just the carotene that was needed.

Here's an idea that may mean a lot to dairymen. We all know that cows can't be profitable unless they are regular breeders. It's no use to blame the bull if the trouble is poor nutrition in the cows. Let's be sure that our hay and pasture is GOOD ENOUGH.

Things Influencing the Way Animals Graze

Condensed from Sheep and Goat Raiser

B. W. Allred
Soil Conservation Service

SEARCH for forage and drinking water dominate the daily actions of livestock, but a number of other items can modify their grazing habits. These items sometimes vary greatly in different temperature and rainfall belts.

Here are some of the influences a ranchman will do well to consider when he is dealing with his stock:

Topography, size and shape of grazing area, and soils: Livestock generally prefer to graze lowlands and comparatively flat lands, leaving steep, broken or rocky ranges to the last. So pronounced is this preference that stock often will trail up a steep hill covered with excellent forage to graze much commoner fare on a mesa or table land. Animals, like humans, like to get their food as easily as possible; it requires less effort on their part to fill their stomachs on comparatively level ground than on steep, rocky ranges.

Livestock graze small pastures fairly evenly, but on large ranges the problem of livestock distribution becomes acute. Odd shaped or triangular pastures are generally harder to manage properly than rectangular or roundish ones. On steep ranges fences can be used to force stock to use the forage evenly.

Most domestic animals avoid wet, muddy or boggy places except when forced to them by feed shortages elsewhere or driven to them to avoid insects. In wet weather they prefer sandy soils to gumbos and heavy clays. They like to graze in soft soil that is free of rocks and gravel. The more desirable plants may continue to grow on a rock ridge or out-crop long after they are grazed out of surrounding areas where relief is gentle and the soils are softer and mature. There may be two reasons for this. First, rocky and gravelly soils are porous, so they absorb more than consolidated, mature soils like silts and clays. Like sandy soils, they yield up moisture quickly for plant consumption. This lets the better plants survive longer under grazing in such spots. Second, the feet of unshod ani-

Reprinted by permission from the Sheep and Goat Raiser, December, 1947, San Angelo, Texas

mals are quite sensitive to rough, sharp rocks and gravel, particularly granite, chert, obsidian, quartz, quartzite and hard and sharply fractured limestone. Sheep graze steep ranges better than cattle and goats are greater climbers than sheep. Many animals avoid steep places so long as they get grazing elsewhere. For example, in the Flint Hills of Kansas, and other similar regions, excellent stands of bluestem grasses still grow on the steep flinty hillsides, whereas cattle have grazed out these grasses on the softer soils of valleys and mesas. At those locations only the less productive short grasses and weeds survive.

Age of Livestock: It is good practice to run a few mature animals with young stock because the older ones will lead the younger ones to choicer feed and provide maximum protection against predators. Older animals are less playful and steadier grazers. Young ones tend to gather in large bunches, and to roam about heedlessly. John Sarvis of the Mandan, North Dakota Experiment Station, says that two-year-olds require about 30 to 40 percent more forage than yearlings. Aged and crippled animals must have choice grazing convenient, since they are unable to travel far. They use forage about 20 percent less efficiently, too, than young ones.

Breed differences: Breed differences show up conspicuously when the herding instincts of the fine wooled Merinos and Rambouillets are compared with those of the long wooled Cotswolds and Lincolns or the Down breeds—Hampshire, Southdown and Shropshire. The fine wooled breeds are more gregarious; the long wooled and Down breeds are individualists, therefore harder to herd. Herefords graze more in open formation—Aberdeen-Angus tend to graze in groups. Polled animals tend to bunch, whereas horned ones crowd less and maintain broken rank formation. Hindu cattle are particularly well adapted to subtropical climates because they have far more sweat glands than English breeds. Too, their large dewlap and sheath and loose skin provides a larger body surface from which to dispel heat.

Breeding season, dipping, dehorning, castrating and branding: Extra care should be given livestock at such times. Plenty of nutritious feed should be provided as near to water as possible. Special consideration should be given males during the breeding season to avoid needless traveling and to keep down fighting, particularly among those with horns.

Heavy fleeced versus freshly shorn sheep and goats: Heavily fleeced sheep and goats graze steadier and deal easier with a range than freshly shorn ones. The former graze quieter, shade

up sooner, and trail less. However, they are more subject to insect infestation and become easier prey for predators.

Thin versus fat livestock: Thin animals graze more contentedly on good range than fat livestock. This continues true until the thin ones begin to take on flesh.

Size of flock or herd: Small herds and flocks usually graze more contentedly and trail less and trample less forage and soil than large ones.

Moonlight grazing: Animals often become nocturnal grazers to avoid heat and insects. Hungry animals on short feed are apt to graze on moonlit and even dark nights. Animals worked or trailed during the day seek their forage at night, whether moonlight or dark.

Patchy grazing: Patches of grass grazed off in the spring are likely to be grazed regularly all year even though patches of ungrazed areas grow untouched close by. The tender regrowths from the continually-grazed spots are more succulent and often provide one to five percent more protein than grass from the untouched patches. Close grazing of such spots kills out the taller grasses and encourages less palatable short grasses and weeds.

On tame pastures this uneven grazing can be minimized by frequent mowing. The clippings can be kept for silage, cured for hay or used for bedding.

Patchy grazing is not so much of a problem on semi-arid ranges as on the bluestem ranges of the sub-humid and humid belt. There, too close and too frequent clipping will kill the grasses. March mowing every two or three years will usually overcome spotty grazing on bluestem ranges. Where patchy grazing occurs on steep or rocky ranges that can't be mowed, occasional prudent burning may be necessary to rid the mid and tall grass pastures of patches of unused grass that hinder even use of all the forage. Burning does not need to be done every year. Fire should be administered only by those skilled in its use. It should be applied early in the spring before the growing season. The burning should be done following heavy dew or light showers so that the speed of the fire and the heat of the flames will be moderate. One misguided burning can ruin more feed, fences, livestock and other property and cause more soil erosion than can be paid for in years of prudent care.

Even use of forage can be obtained in part by shifting portable salting troughs to the larger ungrazed spots. Bedding sheep on such places helps to bring about more equal use. Burning should be used only as a last resort. Range and pasture vegetation is

usually ungrazed around animal droppings and urine spots. Around these locations the ungrazed plants grow lushly because they are provided more than the normal amounts of soil nutrients. Odor first, and rankness second, probably cause animals to pass up the vegetation from such spots. Tame pastures should be dragged often enough to break and spread the droppings; this gives more equal fertilization. Occasional mowing of tame pastures helps distribute the droppings. Mowing cuts off unedible rank vegetation. On an irrigated Kentucky bluegrass pasture, patches of ungrazed grass around droppings were mowed and left on the ground to see if animals would graze as it dried. For ten days following the mowing cattle, horses, and sheep all failed to eat the dry grass.

Protein concentrates: Livestock fed protein supplements will eat a great deal of low quality forage —straw and coarse grass—that otherwise would not be taken. Protein supplements are usually needed on winter ranges where grass is low in protein and phosphorus. This is a wise practice where there is plenty of grass, but care must be taken to leave enough plant residues to protect the plant and the soil.

Salt and minerals: Salt, and often minerals, is essential in the diet of animals. It can be used as an aid in distributing livestock over the range. Without it and other essential minerals animals may trail about seeking the mineral nutrients that they lack. They may lose weight, and often they wear deeply rutted trails while roaming around.

Insects, rodents and internal parasites: Insects and rodents often compete with livestock for green succulent forage. Where infestations of either are so large as to eat off the forage, livestock are forced either to eat less desirable and tougher types or to starve. Insects and rodents generally prefer the fleshy annual plants that increase on overgrazed ranges. Too intensive grazing by domestic animals—grazing that decreases desirable perennial plants—aids the annual plants in invading ranges and hence, helps insect and rodent populations increase. Proper grazing that brings about a return of the desirable climax grasses creates an unfavorable food choice for insects and rodents, so they decrease or disappear. At the Wichita Mountains Wildlife Refuge grasshoppers were 10 times more prevalent on ranges in poor conditions than they were on the excellent climax bluestem ranges. On the same refuge, one large prairie dog town has almost disappeared as numbers of grazing livestock have been decreased. What has happened is that release of the grazing pressure has given the climax grasses a chance to re-

appear and to crowd the weedy plants on which the rodents feed.

During fly and mosquito season livestock may bunch up to fight off insects; in so doing they will usually first hunt the shade of a tree or a shed. If these are unavailable, they climb to windy ridges where some relief may be obtained. They may seek standing water or streams or the protection of thickets to get away from external biting parasites. This is one of the reasons why the ridge tops are often grazed out more than the valleys and slopes. Stock tend to become nocturnal grazers in the summer if they have to spend the daytime fighting insects.

Sick or lame animals or those weakened from internal parasites are incapable of grazing very far from water holes. They overgraze such places—which naturally come to provide less desirable forage plants. Poisonous plants and insects are often found in such locations.

Get the Most Out of Your Range

Condensed from Everybodys Poultry Magazine

THERE are few sights more satisfying to a poultryman than a flock of growing pullets on a good, green pasture. The experienced poultry raiser knows that a good range can be one of his greatest assets.

What makes a good range? Most poultrymen would probably tell you that their idea of a perfect range is a gently sloping piece of land having good soil and air drainage, fertile enough to produce a good crop of grass or clover throughout the growing season, and large enough to handle the required number of birds. Up to 700 or 800 birds may be carried satisfactorily on an acre of good ladino clover, but the number depends mainly upon the degree of sanitation and freedom from disease that can be obtained.

Developing a good poultry range takes time and care. Soil tests should be made to determine the kind and amount of fertilizer needed. Local conditions determine which plants give best results. In the Northeast, Kentucky blue grass, Canada blue grass, perennial rye grass, timothy, orchard grass, birdsfoot trefoil, and the various clovers, particularly ladino are most satisfactory. Alfalfa is not recommended for poultry

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range because it does not allow the proper amount of sunlight to reach the soil. It often makes a mat when packed down by poultry, causing filth and disease infection to accumulate.

Sometimes permanent brooder houses are used on range, but more frequently range shelters of various types are preferred. One advantage of these is that they can be moved frequently. The barracks house and combination brooder house and shelter, both of which have sides that can be opened wide during warm weather, are becoming more and more popular.

Most poultrymen favor spacing shelters at least 150 feet apart, though some folks believe that 250 feet between shelters should be the minimum. Wire netting or boards should be placed around the bottom of the shelters to keep chicks from crawling under the floor. Such spots generally are cool, but are places where dirt and diseases can be picked up.

In preparing shelters for young stock, be sure they are free from all dirt before moving them onto clean ground. Disinfect thoroughly. Paint the roosts with a strong creosote solution at least three weeks before pullets are brought in. This will help control mites.

Plenty of cool, clean water should be available at all times. Many different kinds of watering systems for range are used, but running water is the first choice for the poultryman who has an eye on cutting corners. Pipes are usually buried a few inches to help keep the water cool. They may be covered with boards if they are moved frequently. If the pipes are left out over winter, some poultrymen pump kerosene into them and seal them to prevent winter freezing, while others merely drain them and leave them open. This system is used on permanent ranges.

Attaching float valves to the pipes at the water pans provides a continual supply of water. The pans may be set on wire-covered stands or on gravel to keep the birds away from droppings and spilled water.

Some poultrymen merely have pans or fountains around the range, which they fill daily. Water is carried in barrels or tanks. Bottom sections of wooden milk barrels are often used for drinking pans. Guards around the pans should be used to keep birds out of the water. Drinking pans should be cleaned daily.

Cover feed hoppers to keep out the rain. Move hoppers frequently so that the birds do not make bare spots around them. Keeping a good sod on range cuts down disease. Allow at least two 6-foot hoppers for each shelter of 100 to 125 pullets.

Some poultrymen use pellets instead of mash, and scatter pellets and grain over the ground with a lime spreader, seeder, road sander, or home-made trailer equipped with feed bins. No hoppers are used. Some merely scatter pellets and grain from the bags on the rear end of a truck or jeep as they drive along. Workers at the University of Massachusetts found that body weight of birds managed in this way was good at housing time and maturity was normal. Also, they had no rats on range.

Sheep or beef cattle may use surplus range to advantage, especially where range rotation is followed. They must be kept out of the feed hoppers and range shelters, however.

Provide shade for the birds on range. Covers over feed hoppers and fountains will help to keep them cooler. The birds will eat and drink more. Some poultrymen plant trees just to supply shade. The Normandy poplar is a favorite in some sections because the branches grow up straight and birds will not roost on them.

You may want one or more good watch dogs. Some folks turn on a spotlight at night to light the range so that prowlers or thieves stay away. Using a good electric fence with a charged wire about 6 inches off the ground and 6 inches outside of regular poultry fencing should keep out foxes, skunks, dogs, and other predatory animals. In order to prevent short circuits, grass under the charged wire should be kept mowed or destroyed by spraying with a mixture of three parts furnace oil and one part carbolineum. A 50-50 mixture of kerosene and carbolineum also does the job.

Your grasses and clover will supply the most protein and other food value if they are clipped frequently. It's the short, succulent growth the birds like best and that's best for the birds. Chickens do not range well in tall grass. Then, too, long grass that becomes matted offers a good place for slugs, snails, and beetles to hide. These serve as hosts to tapeworms and other parasites.

Confine birds to the shelters the first two or three days they are placed on range. This gives them a chance to know where they should roost. Feeders and waterers should be supplied during this period, of course. It is wise to keep at least one feeder and fountain inside the shelter all summer if it's not opened early in the morning.

Pullets can be vaccinated as they are moved to range if the weather is warm and dry, although many poultrymen prefer to wait for a week or two after the birds have made themselves at home on range.

Cull the weak birds as they develop on range. Making the rounds of your range every morning or evening to look for dead birds or anything out of order is a good habit and time well spent. Inspect fence rows and around bushes and trees.

Even though your birds will pick up some small stones on range, have hoppers of grit handy. You may be surprised how much grit they need to grind up the grass and other feed eaten on range. Also, supply calcium in the form of calcite crystals or oyster shells.

Harvesting Forage Crops at Bayville Farms

Condensed from Guernsey Breeders' Journal

J. E. Collins and McNeil Marshall
Assistant Extension Agricultural Engineer, Virginia Polytechnic Institute, Blacksburg, Va.

Bayville Farms, Lynnhaven, Va., is located 12 miles from Norfolk. It is a dairy farm, and contains 1,000 acres, of which 750 are in cultivation and pasture. The farm is in a high state of productivity, and an abundance of alfalfa, lespedeza, soybean, clover and oat hay is grown. The average yield is about 800 tons annually. About 250 acres are planted in hybrid corn annually for filling the silos, which have a combined capacity of 2,000 tons. Also, 8,000 to 9,000 bushels of ear corn are gathered each year after the silos have been filled.

From 300 to 325 cows are milked daily for the production of high quality Golden Guernsey premium milk.

Bayville Farms produce forage crops in such quantity that it would not be practical to rely on any single method of harvesting. During a haying season they make use of about all of the known different hay-making methods, and combinations of methods. In past years much of their hay was cured in a dehydrating plant, especially when coastal weather conditions at haying time made it impossible to obtain sufficient field curing for other storing methods. There are a dozen odd barns on the farm, that provide storage space for at least 1,000 tons of long hay. Six

Reprinted by permission from Guernsey Breeders' Journal, Peterborough, N. H., May 15, 1948

of these barns now have hay drier installations for barn curing long hay. In moderately unfavorable weather, hay can be put on the barn driers that formerly had to be cured in the dehydrating plant. Some of the hay is baled in the field with a one-man pick-up baler. Usually, this is hay that has become field cured by remaining in the field a longer time than was necessary for barn storage on the driers. It is stored in the barns that do not have hay driers in them.

All of the corn harvested for ensilage is field chopped with a forage harvester, and is transported to the silo in rubber tired trailer wagons, pulled by a jeep or light tractor. With special unloading belts and mechanism, the three-ton load of silage is unloaded into the elevator chute, and elevated into the silo by a forage blower powered with a portable 40 H.P. electric motor.

The magnitude of the job of harvesting the forage crops grown on this farm makes the harvesting almost continuous during the growing season from May through September. Progressively modern methods and equipment are used in order to get the work done on time, and in order to combat the diminishing farm labor supply in this particular area. Bayville Farms, operating under one management and harvesting by various methods using the same equipment and the same labor crews, appeared to offer a naturally functional laboratory in which at least some of the variables had been eliminated or compensated for, and where actual time and cost data might be obtained that would be reasonably accurate for an efficiently operated farm. It is to be remembered that Bayville Farms is more than an average farm in management, as well as in size, and in making use of any of the following information this fact must be borne in mind. The Bayville Farms, owned by C. F. Burroughs, and managed by W. Clark Fleming, Jr., furnished valuable information from their farm records and experiences in operating this farm. They have a profitably operating unit, and are justly proud of their past accomplishments and are confident of the future.

For each field from which a forage crop was being harvested, the following information was obtained:

1. The time required to do each job, such as mowing, raking, tedding, turning, baling, dehydrating, and hauling and storing.
2. The number of persons in the crew for each job.
3. The kind of power and length of time it was used.
4. Other special equipment used, and the time it was used.

For each piece of equipment used in making hay, and in putting up silage, detailed information was obtained on the cost, age, and average annual use of the machine. With this information and data on length of expected life, cost of repairs, housing, insurance, and taxes, a rate of cost per hour of use on Bayville Farms could be established.

The cost of labor was obtained from the farm records, as all labor involved was hired labor. The rate for day labor was used as representative, since the year hands were furnished considerations that would approximately elevate their rate of pay to equal the hourly rate paid day labor. The current rate of 60 cents per hour for day labor on the farm has been used for all labor concerned in this report.

Charges for the use of horses, or mules, for Tidewater, Va., farms was arrived at from various sources of information, and determined to be about 20 cents per horse per hour. This was the figure used in calculating cost data on mowing hay, which was the only operation where horses were used.

The charges for the use of the machines used in harvesting the forage crops were based on information on cost, age, annual use, and operating cost. Depreciation, interest on investment, taxes, and insurance charges for farm machinery were also taken into consideration in determining the cost per hour of use.

Ohio State University's bulletin, by the Department of Agricultural Engineering, on "Cost per Hour of Using Farm Machinery," was used as a guide in arriving at the cost per hour of use for farm machinery.

The rate per hour for all of the tractors was based on the factors of cost, depreciation by usage and/or obsolescence, interest on investment, cost of repairs, housing, insurance and taxes. The jeep for on-the-farm use has been charged for at the same rate as the Farmall "A" tractor.

The rate per hour to charge for the use of the tractor-trailer job for hauling hay from the field to mow, was arrived at by using the cost per hour for a farm tractor of comparable B. H. P. plus the cost per hour for two rubber tired trailer wagons, which would approximate the size of the big trailer. The cost for the Farmall "M" tractor of 92 cents per hour, and twice the cost of four cents per hour for the rubber tired trailer wagons, amounted to a charge of $1.00 per hour for the use of the tractor-trailer job.

During the time these observations and time studies were being made, the weather conditions were unusually good for making

hay in this farming area, which is adjacent to Chesapeake Bay and Lynnhaven Inlet.

The average temperature for the working date was between 75 degrees Fahrenheit and 91 degrees Fahrenheit, and the humidity ranged from 45 percent R.H. in mid-afternoon, to about 92 percent R.H. in the early morning. This, of course, added up to hot weather. No rain fell during this period; it was, however, hazy part of the morning on one or two days.

Moisture tests on freshly cut alfalfa ran about 65 percent moisture content. This cutting of alfalfa was slightly past the best stage for cutting, or about 50 percent full bloom, and the ground was beginning to show signs of dryness.

Numerous tests at the time hauling started, showed the hay to have around 30 percent moisture content. The length of time for the hay to dry down from 65 percent to 30 percent moisture content was approximately 24 hours. Moisture tests on the same hay at five P.M. and eight A.M. the next morning, showed that during this time hay with 45 percent moisture content did not change over night, but that hay with 30 percent moisture content at five P.M. picked up water during the night to around 40 percent at eight A.M. the next morning. Actually, the curing time in the the field to bring the moisture content down to 30 percent was six to eight hours of good curing weather.

The mowing and raking operations were essentially the same for all of the different methods of making hay. During the time this study was made all of the mowing was done with a horse-drawn mower having a six-foot cutter bar. The team used stepped along briskly, and was not used more than five hours during any one day.

On three alfalfa fields that totaled 14.9 acres, mowing was done at the rate of one acre in 39 minutes, or slightly more than one and a half acres per hour.

The Farmall "A" tractor was equipped with a six-foot mower, and was put into use whenever necessary; however, it was not used while this study was in progress, and consequently no rate per acre was established. It appears unlikely that this tractor mower would surpass the rate of cutting hay of the horse-drawn mower very much, and still do as good a job of mowing as was being done by the old colored man and his mule-drawn six-foot mower.

The established cost of the six-foot horse-drawn mower was 9.2 cents per hour. For mowing 14.9 acres of alfalfa, the total cost for

the use of the mower was 89 cents, or six cents per acre.

As previously stated, about 20 cents per hour per mule was determined to be near the actual cost for the use of the mules. For mowing 14.9 acres of hay, the total power cost was $3.87, or 26 cents per acre.

The cost for labor for mowing hay at the established rate of 60 cents per hour was $5.80 for mowing 14.9 acres of hay, or 39 cents per acre.

The total cost of the mowing operation, including the mower, the power and the labor, was $10.56 for mowing 14.9 acres of alfalfa, or a unit cost of 71 cents per acre.

The side delivery rake was used for all raking. The motive power was furnished by the Farmall "A" tractor usually, but the jeep was put to work raking hay whenever the tractor was on some other job at the time raking needed to be done.

From observation, the best job of raking was done with the tractor operating in third gear at approximately full throttle; however, the jeep raked hay faster than the tractor. The fact that the jeep provided more comfort for the operator, and was easier to operate at higher speeds, apparently accounted for the higher speed of the raking operation. Turning was more difficult with the jeep, and the hay was not as cleanly picked up at the higher operating speed. On four alfalfa fields, totaling 18.4 acres, the average rate of raking was one acre in 20.2 minutes. The longest time to rake one acre was 30.6 minutes with the tractor, including several stops, and the least time for raking one acre was 14.2 minutes with the jeep pulling the rake.

The total cost of raking 18.4 acres of hay was $8.36, or 45 cents per acre, and for raking 14.9 acres the cost was $7.01, and 47 cents per acre.

To mow and rake 14.9 acres of alfalfa hay cost $17.57. The per acre cost was $1.18, and the per ton cost 83 cents. The labor cost for mowing and raking hay was .99 man-hours per acre, or .70 man-hours per ton.

Long Hay

After the hay was raked it was usually allowed to stay in the windrow for a short time in order to allow any green hay that might be turned up time to wilt down to a safe moisture content for storage on the barn drier. By so doing, the hay could also be raked a little sooner, and with less shattering of the leaves taking place.

The equipment used in moving long hay from the windrow to the storage mow, and getting it unloaded onto the barn hay drier

system, consisted of the following machines and pieces of equipment:

1. The two-ton International truck-tractor, 1938 model, and seven foot by 21 foot flat bed Baker trailer.
2. New Idea hay loader.
3. Grapple type hay fork and electric hoist.

When the tractor-trailer and crew arrived at the field, the hay loader was attached onto the rear of the trailer. The loading operation proceeded in the conventional manner, with the driver running the tractor-trailer straddle of the windrow as it moved about the field gathering the load of hay. Three men loaded the hay on the trailer. The speed at which the tractor was driven was determined by the quantity of hay in the windrow, and the speed and adeptness of the men on the trailer doing the loading. Generally, four men made up the crew for hauling long hay from the windrow to storage.

The same labor crew that loaded the trailer in the field unloaded it at the barn. The truck driver operated the hay fork, which was a four-tine grapple type fork. It was run by an electric hoist, which was usually operated by the farm foreman. The other three men in the labor crew were spreading the hay in the mow to get it evenly distributed and packed over the barn drier. Seven to nine forks of hay usually completed unloading the trailer.

The cost of the 11 hay drier installations at Bayville Farms was $11,000. This included the cost of building the necessary auxiliary three-phase lines. The average cost of $1,000 per drier was used in figuring the cost per ton for the use of the hay driers. Taking into consideration the interest on the average investment, the housing, taxes, insurance, the depreciation of the equipment, the maintenance, and the operating cost, as well as the annual hours usage, and use until worn out, it was determined that the cost for drying 30 percent moisture content hay down to safe moisture content for storage (about 20 percent moisture content), was $3.45 per ton. The man-hour cost per ton for operating the driers was very low. All of the drier units were equipped with automatic time switches that controlled the intermittent operating at night. It was estimated that .1 man-hour per ton would take care of all the time spent on the hay driers. The per acre cost and man-hours were based on a hay yield of 1.4 tons per acre.

Summarizing the hauling of long hay from the windrow to the barn, and storing it on the hay drier, it was found that it required 4.43 man-hours to do the job, and

cost $3.86 per ton for the use of the equipment and the operating costs.

Adding the cost of the mowing and the raking to the hauling and storing operations, the man-hour requirement became 5.13 per ton, and the cost $4.69 per ton.

The estimated cost of drying the partially cured hay added .1 man-hour per ton to make the total labor requirement 5.23 man-hours per ton, and $3.45 per ton to make the total cost of making hay by this method, $8.14 per ton.

Baled Hay

All of the hay put up by this method was baled with a pick-up baler. Due to difficulties beyond control, no accurate data were obtained on the actual baling operation. However, the figures used are very near actual data under normal operating conditions.

A crew of four men was employed for hauling in baled hay. One man drove the tractor-trailer, two men threw the bales up on the flat bed trailer, and one man loaded the trailer. Loading started at the front end, with the bales being stacked five high and four per layer; six of these tiers were loaded on the 21 foot trailer to make a load of 120 bales, or approximately that, the last tier usually not being completed entirely to facilitate loading. The load average on the two loads checked on was 113.5 bales per load.

The weight of the bales of hay was approximately 60 pounds per bale, and the average load of baled hay weighed 3.4 tons.

The over-all time for hauling in two loads, and storing it, was four hours, or two hours per load. It was noted, however, that it took 90 minutes to put 115 bales on one load, and that 22 minutes were required to unload the same 115 bales.

Summarizing the pick-up baler and hauling baled hay operations, it required 2.73 man-hours to do the job, and cost $4.27 per ton. Adding the cost of the mowing and raking operations to the baling and hauling in baled hay we found that it took 3.43 man-hours per ton, and that it cost $5.10 per ton to put up hay by this method.

Chopped Hay, Dehydrated Hay

A forage harvester was used in picking up hay from the windrow, chopping it, and blowing it back into the attached trailer-wagon. When the attached trailer-wagon became loaded with about one ton of 30 percent moisture content chopped hay, it was detached from the chopper and an unloaded wagon was put in its place. Some time was consumed in this changing wagons operation, which

was usually done by the tractor operator alone.

Three trailer-wagons, equipped with conveyor belts on the wagon beds, were used. One wagon was being loaded, one was being unloaded, and one was enroute to the dehydrator or to the field, or waiting to be loaded or unloaded. About 25 minutes over-all time was required to attach, load, and then detach one of the trailer-wagons.

The trailer-wagons were pulled from the field to the dehydrator, and vice versa, with a jeep; the loaded wagon was left at the dehydrator, and the empty returned to the field.

At the dehydrating plant, the unloading chute across the driveway was counter-balanced and could be raised or lowered by hand so that the loaded trailer-wagons could be pulled into place with little, if any, backing up. Little time was lost in changing wagons at the unloading chute; the empty wagon was pulled out of the way by hand, and the loaded wagon was pulled right into place behind it with the jeep.

The unloading was simplified by using the trailer-wagons equipped with the conveyor belts.

The unloader unit consisted of a home-made push cart and frame, and a shaft set in two bearings and having a sprocket gear, universal joint, and sleeve connecting arm on it. Two speed reducer units connected in series and operated by a one horsepower electric motor reduced the motor R.P.M. from 1,750 to three R.P.M. of the shaft, and at the same time stepped up the torque sufficiently to easily move a three-ton load of silage from the front to the rear of the trailer-wagon. The sleeve connecting arm was attached to the squared end of the shaft with the sprocket gears forming the back end rollers for the conveyor belts in the trailer-wagon bed.

The endless conveyor belts moved 16 inches per minute. At this speed it required about 12 minutes for the conveyor belt to travel the length of the trailer bed, which was 16 feet. About 20 minutes were required per load for unloading chopped hay because the unloader unit was operated intermittently to avoid feeding the chopped hay into the dehydrator tube faster than it could be properly dried down to safe moisture content.

From the unloading chute the chopped hay was conveyed by elevator to a hopper near the top of the dehydrator furnace, from which it fed by gravity into the heat filled dehydrator tube.

This large cylinder was made of half-inch thick steel boiler

plates, with riveted overlapping joints. It was about 50 feet long and six feet in diameter.

As the chopped hay emerges from the dehydrator tube in an auger conveyor placed at right angles to the end of the tube, it is continuously checked for dryness and discoloration from overheating, or scorching. The rate of feeding the green chopped hay into the dehydrator is regulated by observations of the plant foreman of the dried hay as it comes out of the dehydrator tube.

The auger conveyor deposited the dehydrated hay on a conveyor belt elevator which carried it over a six inch by eight inch electromagnet recessed about one-half inch in the bottom of the elevator, and on into a blower. The purpose of the magnet was to pick any pieces of metal out of the chopped hay as it passed over it. Occasionally, a piece of wire is raked up in the field and goes through the forage harvester where it is cut up into nail-like pieces that, if fed to valuable livestock, result in costly losses. The blower moves the dried hay over to an adjacent building where from the dust collector it moves by elevator to the bagger. The peanut bags are filled by two operators, sewed up by another, and moved back and stored by two more men. The average weight of the bags of dried hay was 38 pounds just after bagging and sewing up. It was said that this hay would pick up some weight by adding moisture in storage. The dehydrated hay, as it came from the dehydrator cylinder, was near zero percent moisture content.

The heat for operating the dehydrating plant came from Bunker "C" oil, as a main source. This oil was preheated by introducing it into the dehydrator furnace, mixed with live steam that was supplied by a 15 H.P. coal-fired boiler. The dehydrator furnace was made of brick with an outside dimension of eight feet by eight feet by 10 feet. The walls were 24 inches thick, including the 12-inch inside lining of fire brick. The intense heat inside the furnace when it was in operation could be observed through a peep hole about two inches square in the front wall of the furnace.

A crew of laborers to efficiently operate the dehydrator plant consisted of not less than eight men.

Eleven tons of approximately 30 percent moisture content chopped alfalfa hay were run through the dehydrator. At the bagging plant, 362 bags of dried, chopped hay were collected that weighed, on the average, 38 pounds per bag. This data indicated that 11 tons of partially field cured hay were dried down to 6.88 tons when run through the dehydra-

tor; a loss of 8,240 pounds of water.

The rate of dehydrating hay was found to be 2.4 tons per hour wet hay, or 1.53 tons per hour of dried hay.

The investment in the dehydrating plant is heavy, as the cost of the plant is listed at $10,000. The fixed yearly charges for the dehydrating plant would be $350 per year.

We arrived at a cost per hour of $1.75 for fixed costs, 65 cents per hour for maintenance and repairs, and $2.50 per hour for depreciation. This amounts to a total of $4.90 per hour for the use of the dehydrator.

The operating costs of the plant include the fuel for heat, the power for operating, and the bags for bagging the dehydrated hay.

Totaling these costs, we obtained an operating cost of $6.30 per hour's use of the dehydrator.

The total cost for the use of the dehydrator, and for operating it, was $11.20 per hour.

Summarizing the cost and labor requirements for this method of making hay, we found that it cost $2.07 to chop one acre of alfalfa hay with the forage harvester, or $1.61 per ton of hay. The labor required was found to be .47 man-hour per acre, or .36 man-hour per ton.

Hauling the hay from the field to the dehydrating plant cost 71 cents per acre, or 56 cents per ton. The labor requirement was .52 man-hour per acre, or .41 man-hours per ton for chopping hay.

The dehydrating cost, including the labor for operation, was found to be $8.38 per acre, or $10.47 per ton based on the dry weight of the hay. It took 4.19 man-hours per acre, or 5.23 man-hours per ton, to operate the dehydrating plant.

The total cost of dehydrating alfalfa hay at Bayville Farms, as figured in this report, was found to be $12.32 per acre, and $13.47 per ton. The labor requirements amounted to 6.17 man-hours per acre, or to 6.70 man-hours per ton of dehydrated hay.

A modern forage harvester was used for cutting and field chopping the ensilage and the chopped ensilage was blown directly into a trailer wagon. Only a medium size tractor was required to draw this equipment, as the harvester contained its own power plant. The tractor driver also operated the harvester, and he could attach one of the wagons, fill it with chopped ensilage, and detach it in 24 minutes.

The same three trailer wagons were used to haul the chopped ensilage to the silo, that were used to haul the chopped hay to the dehydrator. Each wagon held three tons of chopped ensilage,

and could be unloaded in 10 to 12 minutes by using the unloading unit and the endless belts in the wagons.

As soon as a wagon load of chopped ensilage arrived at the silo, it was unloaded into a blower elevator, powered by a 40 H.P. portable electric motor, which delivered it into the silo.

Four men were used to fill silos at Bayville Farms. One man operated the harvester, one man hauled the chopped material to the silo, one man operated the unloader unit and elevator, and one man distributed the chopped material in the silo. The fourth man was required because the silos had such large diameters the blower elevator could not be depended on to properly distribute the silage in the silo.

The total cost for chopping, hauling, and storing one ton of silage was $1.02, and required .6 man-hour. These costs are based on the interest on the initial investment, depreciation, taxes, housing, annual hours' use, expected life, operating expenses, etc.

New Lease "Rider"

Condensed from Iowa Farm Science

I. W. Arthur

PUTTING a "rider" on that lease can help save your land from costly, wasteful erosion. It's a simple one-page agreement designed to help tenants and landlords get together on a practical plan for keeping topsoil on the farm—where it belongs. It may also be used for other improvements.

This "rider" agreement goes along with the ordinary farm lease whether that lease is oral or written.

It takes one big risk out of renting which tenants have faced in the past. Often there is no way of knowing how long a tenant can stay on a farm. That is why most tenants can't afford to spend much on soil improvements. There is no profit in putting a lot of work and money into a farm if you may move off the next year.

That's where the conservation lease rider comes in. If the tenant must move off the farm, it guarantees him fair payment for

Reprinted by permission from Iowa Farm Science, Ames, Iowa, November, 1947

the unused value of soil improvements he has made. The lease rider makes it easy to figure out just how much "fair payment" will amount to. It is all written down in black and white. Every point is agreed to before improvements are made.

In this way both the tenant and the landlord can feel free to go ahead with a soil saving program. Both of them will share the returns from the improvements. And neither of them will lose, even if the tenant is forced to leave the farm.

The lease rider was worked out through the cooperation of Mills County farmers, soil conservation officials and Iowa State College.

First the owner and operator must decide what conservation practices they will undertake during the year. They may want to use lime, commercial fertilizer, or green manure crops. They may decide on contouring, building terraces and grassed waterways, or any other practices. When the owner and operator have made up their minds, they list the improvements that they plan to make in Section A of the lease rider.

Second, they must decide how the improvements will be paid for and who will furnish the labor and the machinery. This too can be worked out in many ways. In liming, for example, the owner may pay for the limestone and the spreading. Then the tenant has nothing coming if he leaves the farm.

Or the tenant may furnish the limestone and do the spreading. Then if he moves, he is repaid according to agreement. At the end of the first year he is usually paid the full value of the liming operation. For every year after that the value is depreciated a straight 20 percent.

Another possibility is that they will split expenses on a fifty-fifty basis. The tenant would then collect only half the unused value of the liming when he moves from the farm. The contributions which each expects to make are listed in Section B of the lease rider.

Next they estimate the cost or value of the tenant's contribution to each new practice. This figure is listed in Section C.

In the last part of the rider, Section D, tenant and landlord decide on the "length of life" of each practice. They list how much should be paid back to the tenant if he is forced to move in any given year. Suggestions which come with the rider tell how this already has been worked out for many practices.

It is generally agreed that the rider should not cover too long a period. The value of the tenant's investment should be written off

in 5 or 6 years at most. This seems best even though the actual value of the improvement may last much longer. Problems and misunderstandings may arise if a longer period is used.

For example, the effective value of limestone may last as long as 10 years under average Iowa conditions. But in the lease rider, the "length of life" of limestone is figured at 5 years, skipping the first crop year. After the first crop year, a straight 20 percent depreciation is marked off. The unused value at the end of the second crop year would be 80 percent, at the end of the third year 60 percent and so on.

Depreciation figures have been worked out for commercial fertilizers and other conservation practices.

Standard terraces are figured on the 5-year depreciation basis, even though they may last much longer under good maintenance. Grassed waterways are given a yearly depreciation of 33 percent.

It should be made clear that the lease rider protects the owner as well as the tenant. For example, the tenant is obliged to maintain terraces once they are erected on a farm. If he lets the terraces go to ruin without working to maintain them, he may have to repay the landlord for the cost of repairs. However, in case of a cloudburst or other "act of God" which would destroy the terraces, the landlord should help pay for their repair.

Farm drainage improvements usually are the entire responsibility of the landlord. However, sometimes a tenant does tile out a pond or construct an open farm ditch for drainage purposes. It is suggested that a 5-year depreciation schedule should be used for such operations. A straight 20 percent mark-off should be made on the investment each year.

Resetting fences can be a big job where contouring, terracing or strip cropping is to be followed. If the tenant furnishes most of the labor for moving the fences, this can be covered in the lease rider too. He may want to place a value on his labor investment and write it off at 20 percent each year.

In all cases, the share of the unused value of the improvement is figured on the basis of the contributions which were made by the owner and the tenant. If the tenant made all the contributions, the unused value belongs to him, and vice versa. In the same manner, these contributions can be used to divide government payments. If a tenant made all the contributions in starting a conservation practice, he may receive the government payment. If they contributed equally, they may divide the check. Any agreement

which is satisfactory to both may be used.

The rider is set up to provide a written record of the complete agreement. It covers the practices to be followed, the expected cost of the work and materials, the contribution of the landlord and tenant, and one more important thing. If the tenant must move off, it agrees to a schedule of repayments due him for any unused value of practices which he helped establish. This is based on a depreciation schedule for each practice included in the rider.

The lease rider will not solve all the problems of soil conservation or all the problems of farm tenancy. But it can provide a good start toward controlling soil erosion on rented farms.

In the past most tenant-operated farms have lagged far behind in conservation work. And there have been three losers—the landlord, the tenant and the land.

The rider is a sound, impersonal method of promoting good farming practices on rented farms. It works as well for other farm improvements as it does for conservation. If landlords and tenants can work together for better farming through this agreement, they—and the land—will profit.

Weather Planning for Farms

Condensed from Capper's Farmer

R. F. Dale
U. S. Weather Bureau

I WANT to plant my vegetables as early as it is safe, because early crops usually bring the best prices, but I don't want to lose my crops from frost. When should I plant?"

That query came from a farmer to the Weather Bureau office in an eastern truck crop area. After analyzing the past weather records and checking the time needed for vegetables to come up and their frost hardiness, the weatherman replied: "If you will plant these vegetables on or about April 7, you will have about 1 chance in 5 of losing your crops from frost."

Later the farmer wrote again saying he had planted according to the Bureau's advice; his crops did well and were sold at a good

Reprinted by permission from Capper's Farmer, Topeka, Kansas, January, 1948

price on an early market. Neighbors, tempted by an early spring, planted much earlier. Most of their crops were killed by a later than average frost.

That is an example of farm planning based upon climatology. Many farmers use climatological knowledge right along, but they don't know it by that name. For instance, a farmer usually knows from experience about the number of years in which he can expect a poor crop. He may also know that certain crops will not thrive in his area and that a few grow better in some places on his farm than in others. He has a good idea of the right times to plant various crops and he generally knows the periods in which the weather will be most critical for crop growth. All this is climatological knowledge.

There are other farm operating problems which require additional weather information for their solution. Such facts, in large measure, are supplied by the Weather Bureau's regular 24- and 48-hour forecasts, and its special advices and warnings. Recent 3- to 5-day agricultural outlooks give the farmer that much of a head start on the weather. For monthly or seasonal planning, however, sufficiently accurate and detailed forecasts have not yet been attained.

But the farmer can use climatology in long-range planning. It will give him an idea of the kind of a growing season he can expect, based on past records; indicate the chances for each of his crops; describe the climatic characteristics of different parts of his farm and show how to take advantage of those characteristics.

Suppose a new farmer comes to an area or an experienced farmer moves to a new location. Both lack farming experience in the locality to help them plan their crop layouts. This is an agricultural climatological project—planning the cropping program to fit the land and the weather. Perhaps a check-up might show that due to cold air drainage, a particular low spot is subject to later spring frosts and earlier fall frosts than the rest of the farm. This area could then be planted to shorter maturing crops. Surely, it never should be planted to an orchard or to crops sensitive to frost.

This kind of weather planning pays off. Within a distance of 1 mile in the fruit districts of California can be found all the varying degrees of efficiency in operating orchards—from one which always operates at a profit to one which often operates at a loss. The one has little frost; the other suffers considerable frost damage every year.

General maturity dates for various crops can also be estimated on

the basis of the past, current, and probable weather, making adjustments from time to time. Planning the planting dates of a vegetable crop to permit harvesting a convenient daily quantity at the right stage of maturity is extremely important in marketing. Such an experiment was conducted successfully at Seabrook Farms, New Jersey, in 1947. The "weather planned" areas outyielded the others in quantity and quality of the crop produced, providing an excellent example of applied agricultural climatology.

In Iowa, the Weather Bureau has for years been co-operating with the Iowa Department of Agriculture on corn-weather research. Reliable estimates of corn maturity dates there can now be made and, with temperature studies, the probability of frost damage to the corn crop can be forecast.

A Major limitation on a program of agricultural climatology is the lack of research on the exact effects of weather on plant growth, yield and quality of the crop. When these relationships are known, yield and quality can be estimated early in the season by keeping a running account of the weather. Such things as the protein content of wheat and the vitamin content of vegetables can be forecast. The amount of crop damage by boll weevil, black stem rust of wheat, or certain durations of high temperatures, water supply for irrigation, and the lengths of drouth injurious to yields, are other factors which can be estimated thru climatological methods.

We have many general misconceptions concerning applied climatology. One, for instance, is that weather studies are made in some magical manner by "robots." The "robot" used is nothing more than a machine such as is found in many business offices. Its use requires first, that many years of data be punched on cards for each station for which a climatological study is to be made, and, second, that the cards be run thru the machine to sort and summarize the information on them.

Another false impression is that the farmer's weather problems can be solved with the aid of a map showing equal lines of rainfall amounts, mean temperatures, average frost dates, or some combination of the weather elements. Altho such maps can give the farmer a general idea of the climatic variations within the state, these variations may be different over neighboring farms and even within small areas on the same farm. Therefore, it is not only difficult, but impossible to solve all of a farmer's weather problems at once by referring to

generalized charts. Rather, it is necessary to analyze each individual farm for climatic factors as they would affect the specific crop grown.

Altho the Weather Bureau is now in the Department of Commerce, benefits of weather services to the individual farmer still are available thru county agricultural agents. Looking into the future, however, there is a real possibility that the benefits of weather planning can be made more available to the individual farmer thru an agricultural climatologist who, for a fee, would study and analyze the climatological data on his farm and show him how to apply it in his planning.

Water Put to Work

Condensed from Soil Conservation

Wellington Brink
Editor

WATER is the No. 1 problem on many a farm. Millions of fertile acres do not produce today because they are too wet or too dry or—alternately—both. But modern techniques of water conservation and management have shown us what to do.

The new science came to 3 million acres in South Carolina. There, where production had never been safe, the land responded with a bang.

The new techniques include a lot of ingenious devices you have probably never heard of. They are used separately, or in combination, to suit the situation. They have become the very crux of most of the farm plans now being written in the Charleston and the Georgetown-Williamsburg Soil Conservation Districts. And they are getting a terrific workout down there in the Low Country.

A few weeks ago I visited this area at the urging of Hugh Bennett. The Chief of the Soil Conservation Service makes it his business to conserve farm water along with farm soil, and I saw a convincing demonstration of how water can be controlled and put to work.

The Low Country has to cope with irregular weather, and with fields that are close to sea level. Three months of rain alternate with long stretches of clear skies.

Reprinted by permission from Soil Conservation, Washington, D. C., January, 1948

Water management's task is to rush "excess" water off the land and later, in many instances, to redistribute it, an inch or a fraction of an inch at a time during dry spells.

On some farms the technicians virtually put the water table on a hoist, raising or lowering it almost at will. On others, they provide a gridwork of drainage ditches and a battery of pumps which speed heavy downpours off the fields and into the sea. Here and there they locate tidal gates to let sweet water off and keep salt water out. Large main canals are used not only for drainage but also for storage. Now and then, dikes are erected along the coast as defenses against tide and storm. There are elaborate systems of reservoirs and of surface, subway and overhead irrigation. There are tile drains, deep and shallow wells, open ditches.

Clearing the land is no small undertaking in itself. It's done on a grand scale. Sizeable trees topple under the grim fury of the bulldozer, and smoke from burning brushpiles can be seen many miles away.

The districts bring in Soil Conservation Service technicians to analyze, plan and follow through. The districts also see that contracts are drawn properly, that needed equipment is made available, and that maintenance is provided.

Let's visit a few plantations, with Remo Molinolari as our guide. "Moli" is a crack engineer, as expert in human relations as in hydraulics. He's district conservationist.

First stop is Scottswood plantation, which a few months ago was a great shallow lake due to lack of outlets. It is typical of the 70,000-acre "frog hollow" section of Lanes Community, Williamsburg County.

Two Junes ago Scottswood's 5,000 turkeys were pounded by rains that had them roosting in trees or clawing for foothold on a few exposed knolls. All but 50 of the farm's 7,000 acres were waterlogged, and they stayed that way until the district moved in with SCS technicians. The technicians were rubber-booted, courageous, and imaginative. They waded knee-deep, even hip-deep, to make surveys and run accurate drainage lines. Then they called for draglines, gouged out 50,000 cubic yards of main canal, laterals, and ditches, and kicked the extra water into Ox Swamp. It cost not more than $14 per acre to set the farm free. Oliver Iselin, owner, was so happy that he celebrated by putting on carpet slippers and walking across his entire place to show everyone that it was dry!

Drainage merely set the stage. It made possible the development of a complete farm plan. For generations Scottswood had been the largely unchallenged domain of fox, rabbit, and hoot owl. Now those rich, mellow, sandy loams—capable of growing almost anything—were ready for work. Attention shifted to such matters as fire lanes, brush-clearing, selective cutting of trees, rotations, liming, and fertilizing. Fields of truly virgin soil could now be plowed and put in shape. Scottswood's improvements are now bringing bumper crops of corn, cotton, Sudan grass, tobacco, fowl, butterfat, and red meat. Still better, the gains can be held and the improvements made permanent. It all started with the new wrinkles in water management.

Scientific planning is fundamental. Bad ditching can hold back a farm. But good ditching can spur it along to full and continued production. Nowhere else is this better illustrated than on the adjoining farms of M. L. Few, J. E. Pettigrew, Jr., and D. C. Brown, which lie 10 miles out of Kingstree.

On Few's farm I saw one of the old ditches, a small crease with an effective depth of only 18 inches. Close to it is one of the new man-sized ditches 6 to 7 feet deep. Comprehensive planning enabled Few to continue with both cattle and row crops without sacrifice to either. In the 5 years he had owned the place there were times when it was almost entirely flooded. Properly drained, however, the old acres on higher ground are safe, and they have been joined in safety and productiveness by 300 additional acres. Tobacco wilt has almost disappeared. Winter grazing has cut down the feed bill. The black Angus herd has increased from 40 to 75. Sale of timber to pulp mills has almost paid for clearing. *Crotalaria spectabalis*—resistant to nematodes—has earned itself a niche in the tobacco-soil-building scheme.

Water technicians attach importance to the factor of convenience. Few benefits from this. On his farm there are 20,000 linear feet of farm ditches and 5,000 feet of main canals. One of the latter is graded east, the other west, with a bit of low plateau between. The lay-out is arranged in square blocks of 15 to 20 acres each, not too small and not too large. Fencing is facilitated. Few can plant or cultivate all day long with little interruption or delay. Farm roads and bridges are adjusted to the requirements of drainage, machinery, and farm operations.

Few's drainage system extends right across the farms of Pettigrew

and Brown. You can do that kind of thing in the districts.

Most phenomenal of all is the water handling on Greenfield plantations, not far from Georgetown. Dependable water and dangerous water are harnessed to the wagon. On this farm an inch or two of moisture either way can make or break a crop. Greenfield's land is rich but it is also nervous and temperamental. And the seasons are tricky.

Three hundred acres have been cleared of trees and brush, drained, and put to work making corn, small grains, and hay for a herd of Herefords. Fertilizer is needed generally. Some fields, especially those that have been under water a long time, require heavy liming and fertilization: 2 tons of lime, 100 pounds muriate of potash, 600 pounds of 16 percent superphosphate, at the outset, and substantial booster injections every third year hereafter. Water control comes high at times, but it pays off in high-income, specialized crops.

Dark, loamy soils heavy in organic content cloak the fields to a depth of 10 inches. Under them is a layer of clay. Lower still is a deposit of sand of unknown depth. In this sand Nature supplies a "tile" drainage system of her own, so extensive and so effective that in dry periods it virtually bleeds the land to death. Trying to grow crops was highly hazardous until the district and SCS technicians essayed some bold experimentation. They undertook to test the theory that the sand could be used for two-way traffic, that it could direct moisture back to the crop when desired, and that the water table could be adjusted somewhat arbitrarily by skilled engineering.

To control the water level entailed the installation of 2 miles of main canals and 5 miles of laterals and farm ditches. Close to 40,000 cubic yards of dirt was moved —many a big bite by the draglines. The main canals averaged 5½ feet deep; 4 to 5 feet wide at the bottom; side slopes, 2: 1; spoil banks lashed down by kudzu. Maximum depth of farm ditches is 30 inches, which permits machinery to cross.

The canals, equipped with gates, catch the torrential rains and dump part of the excess water into the Black River. But they do not dump all of it. They bank a portion as reserve capital, impounding it against the frequent dry spells of April, May, June, October, November, and December. The captured water, backed up through the sands and held slightly above their surface, is kept in reach of the roots of thirsty plants. The canals serve the multiple purpose of drainage, storage, and spoon-feeding.

But for downright complications, Moli nominates the Copohee farm, near Mount Pleasant. T. W. Thornhill and Osgood Hamlin, operators, work within extremely narrow limits. One-half to three-quarters inch of moisture at precisely the right time makes the difference between complete crop failure and a recent average gross of $1,000 per acre from beans, cucumbers, and squash. The water system paid for itself in one season.

Three miles of kudzu-covered dikes protect two adjoining farms against the Atlantic's spring tides. Before these 7½-foot barriers were thrown up the land for 1,200 feet back of them could not safely be cultivated.

Included in the system are two reservoirs of a million-gallons capacity each, for irrigation. The reservoirs are tied up to the drainage lay-out to catch the surface run-off. The overflow goes down diversion ditches to the sea.

Back over the fields from the reservoirs extends an overhead sprinkler system. It is set up not more than about twice a year. Two-inch and four-inch portable pipes, hooked up to portable pumps, return to the soil just enough of the once-rejected run-off to supply the growing plants the sip or two they need, at precisely the moment they need it most.

Rounding out Copohee's facilities are combination drainage-storage canals and metal tidal gates—devices now becoming typical. Without them, the shallow-rooted truck crops would have a tough time of it.

Thornhill and Hamlin arrived at this water wizardry after extensive consideration of all the simpler methods. Moli tells me that the reservoirs got the nod after the experts had given up on wells. Shallow wells were not too salty but fell short of adequate capacity. Deep wells were known to have capacity but too much salt. At Copohee water of more than 500 parts of salt per million is regarded as undesirable for irrigation.

The Low Country does not follow a tight formula. This is perhaps the point of greatest significance. Each system is custom-built. Land types, tides, water tables, soil permeability, farmer preferences, and innumerable other factors dictate how water shall be managed.

The evidence is in. Most of the challenge of the Low Country is yet to be met. But enough already is on record to clinch the case for water conservation and management. It takes imagination, it takes farmer cooperation, it takes science—but water problems *can* be solved and an important new agricultural frontier developed.

Field Grown Fuel

Condensed from The Nation's Agriculture

Herbert W. Hall

THE possibility of coping with the perennial surplus problem through disposal of grains in industrial channels promises to become a reality at last. Recent steps in research point to a probable grain outlet in the form of alcohol for use as motor fuel, large enough to consume all the surplus likely to develop in the future.

The idea of using grain on a wide scale for production of alcohol is not new. In the surplus period of the 1930's, many farm leaders and economists advocated the proposition. Then, however, two factors stood in the way of effective action along this line. The petroleum industry had a surplus problem of its own and was naturally not very enthusiastic about absorbing farm surpluses in the liquid fuel market. In addition, conversion of grain to alcohol was then considered too costly to be practicable.

The present situation is vastly different. Petroleum products are short, and the shortage is likely to last. Demand is increasing rapidly due to a number of causes among which are increased farm mechanization, greater use of fuel oil for heating, the expanding use of Diesel engines by railroads and industry, and the tremendous use of fuel oil and gasoline by the military. During the ten years preceding 1947, domestic demand for petroleum products increased almost 70 per cent.

The cost factor remains a problem, but one which seems near solution. Dr. G. E. Hilbert, director of the Department of Agriculture's Northern Regional Research Laboratory at Peoria, Illinois, recently told a meeting of the National Farm Chemurgic Council at Omaha, Nebraska, about the strides being made by science toward the practical, economic use of alcohol from agricultural sources as a supplementary motor fuel.

"It is evident," said Dr. Hilbert, "that conversion to alcohol of any surplus grains that might develop in the future could easily be absorbed in the market for motor fuels. This market is so tremendous that a surplus would disappear, figuratively speaking,

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practically overnight. The possibility of accomplishing this without government subsidization is very promising. Alcohol from dollar corn may well be competitive with gasoline if the alcohol is used by direct injection in automobiles, buses, and trucks."

Experiments at the Northern Regional Research laboratory have indicated that blending one gallon of ethyl alcohol with nine gallons of regular gasoline gives the same result as ten gallons of premium grade, anti-knock motor fuel.

The use of alcohol-gasoline blends would help to conserve petroleum supplies, since it would eliminate much of the need for high-grade gasolines. Much more low-grade than high-grade gasoline can be produced from petroleum.

However, according to Dr. Hilbert, the benefit obtained by blending alcohol with gasoline is not large enough for alcohol to command a premium price over gasoline. To compete, alcohol, when used as a blend, would have to sell at essentially the same price as gasoline, reflecting a corn price of less than 30 cents a bushel, or a similarly low price for other grains.

"Under these circumstances," he points out, "the production of alcohol from grains would have to be subsidized, unless the petroleum industry voluntarily decided to use alcohol and pass the cost along to the consumer."

More hopeful, from the farmer's point of view, is the method of using alcohol in a manner different from its use in a gasoline blend. This consists of direct injection of an alcohol-water mixture into the manifold of the engine. Originally developed for use in war planes, the injection method increases power under heavy load. It can be used in trucks and cars by means of a device which injects the mixture only when it is needed.

The economy is obvious. In the case of high-grade gasoline or an alcohol-gasoline blend, the high octane fuel is fed continuously even when the car is traveling on a level at an even speed, although under these conditions the high octane rating is unnecessary. The alcohol-water injection, on the other hand, confines the high octane use to the occasions when it is needed, such as in starting, passing a car, or climbing a hill.

For this economical use, alcohol from grain could, in Dr. Hilbert's opinion, command a substantial premium over ordinary gasoline as a motor fuel. With gasoline prices at about their present level, alcohol for injection could probably sell high enough to reflect a corn price of about a dollar or slightly more per bushel.

The Northern Regional Research Laboratory's work on alcohol covers efforts to lower costs of converting grain to the finished product. Development of a fungal amylase as a substitute for the malt ordinarily used in the manufacturing process has made possible a reduction of about three cents a gallon in the cost of the conversion process.

However, Dr. Hilbert emphasizes that processing procedures have reached a fairly high degree of efficiency, and scientific advances in processing cannot be expected to have a very material effect on the cost of alcohol.

Of less direct economic significance to the farmer is the laboratory's experimental work on the conversion of farm wastes to liquid fuels. At present alcohol and several by-products are being produced from corncobs by a process developed by Dr. E. C. Lathrop and John W. Dunning. Other crop residues available for conversion to liquid fuels are bagasse, a by-product of cane sugar refining. Dr. Hilbert estimates that a year's supply of readily available corncobs and bagasse could probably be converted into only about one day's supply of our national liquid fuel requirement.

Grain also could play only a relatively small role in meeting future fuel requirements. Dr. Hilbert points out that "If petroleum were replaced, gallon for gallon, with alcohol, more than 30 billion bushels of corn, or equivalent quantities of other grain, would be required for its production." This theoretical figure compares with our actual total annual production of about five billion bushels of all grains.

A new factor favoring the use of alcohol injection as a fuel supplement is the trend in the automotive industry to produce high compression engines. Such engines will require super-octane gasoline, and petroleum refiners have indicated a definite problem in furnishing large enough quantities of super-octane gasoline for this purpose. Alcohol-water injection used in conjunction with present day gasoline is one of several ways to meet this need, according to Dr. Hilbert.

Although conversion of surplus grains to alcohol is necessarily a matter of theory at present, if and when the surplus problem returns agriculture will have an outlet at something like a reasonable floor price, provided the research being conducted by agricultural scientists is translated into practice. Such a development, Dr. Hilbert believes, "will be of immeasurable importance not only in stabilizing our agricultural and national economy but also in utilizing our resources to the best advantage."

Dairy Cattle Breeding Experiments

Condensed from The Dakota Farmer

J. B. Parker
Dairy Specialist Bureau of Dairy Industry, Beltsville, Maryland

INTEREST in cross breeding dairy cattle has been stimulated in recent years by the spectacular results obtained with hybrid corn, and also by experimental and practical results obtained by crossing breeds of beef cattle, swine, and poultry. The increased yields obtained by crossing breeds or varieties are usually attributed to so-called hybrid vigor.

Whether crossing the dairy breeds will bring forth hybrid vigor, expressed by an increase in milk or butterfat yields, is one of the questions to be answered by a cross-breeding experiment begun in 1939 at Beltsville, Md. The whole field of cross breeding dairy cattle will be explored in an effort to develop as much useful information as possible.

The major plan of the experiment calls for the use of proved sires, mated to production-tested cows of four different breeds—Holsteins, Jerseys, Guernseys, and Red Danes. Females resulting from mating two breeds are mated to a proved sire of a third breed. The resulting three-breed females are mated to a proved sire of still another breed. When the four breeds have been combined, the circuit will be repeated with proved sires of each of the various breeds.

All cows are milked three times a day, for 365 days, and bred 4½ months after calving. No culling is practiced and all females are tested for production, usually during the first lactation period.

Production records are now available for 50 crossbred cows, each representing a combination of two breeds. The average production of these two-breed cows, at the average age of two years and two months, was 12,958 pounds of milk and 586 pounds of butterfat. This was an average increase over their straight-bred dams of 2,705 pounds of milk and 141 pounds of butterfat per cow; 41 of the 50 crossbred cows produced more milk than their respective dams, and 47 produced more butterfat.

The 27 three-breed cows averaged 13,130 pounds of milk and 618 pounds of butterfat, at two

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years and two months of age. This represents an average increase over their two-breed dams of 14 pounds of butterfat per cow and a decrease of 35 pounds in milk yield; 17 of the 27 three-breed cows were better than their respective dams in both milk and butterfat production.

Since the preceding experimental plan was developed, it has been necessary to drop the four-breed plan because of the lack of a good proved Guernsey bull.

The results obtained are on large enough groups now to be considered really significant. They continue to indicate that the use of good proved bulls in a cross-breeding program produces offspring, on the average, that are superior to those obtained by straight breeding. The commercial application of this program would seem to lie in the use of the superior sires in artificial breeding associations, by dairymen with high-grade herds, to obtain cross-bred replacements for their herds and to get the benefit of the so-called hybrid vigor.

The proved-sire system of breeding was started at Beltsville, nearly 30 years ago, as a new theory in cattle breeding. The objective was to develop herds or strains that would be reasonably "pure" in their inheritance for the factors responsible for high levels of milk and butterfat production.

The specialists theorized that this objective might be accomplished by using an unbroken succession of good proved sires over a period of years. A sire, that had shown by his breeding performance in some other herd that he would get daughters that were uniformly higher producers than their dams, was considered a desirable proved sire. According to the theory, each succeeding sire would add his quota of good germ plasm to the contribution of the preceding sires and, eventually, all animals born in the herd would carry a concentration of the germ plasm transmitted by the whole series of proved sires. Every heifer calf would then be a potential high producer and every bull calf, having the same inheritance as the heifers, would be a potential sire of high-producing daughters.

We have now used the proved-sire system of breeding long enough, both in the Holstein herd and in the Jersey herd, to recommend it as one of the quickest and surest ways to build a high-producing herd. To date, seven proved sires have been used in the Holstein herd, and 15 in the Jersey herd.

The 34 cows selected for the foundation Holstein herd averaged 678 pounds of butterfat per cow. The 36 foundation Jerseys averaged 622 pounds. In both

herds the average butterfat production per cow is now more than 200 pounds higher than it was in the foundation herds—an increase of approximately 30%.

No females have been added since the foundation cows were bought, except the daughters of proved sires born in these herds. Since all females have been fed and milked under uniform conditions from the start of the experiment, and all daughters of every sire have been kept until they completed a production record, the improvement in these herds can be attributed to the system of breeding and the quality of the sires used.

Another indication of the good germ plasm that has accumulated in these herds is the increasing number of high-producing individuals. Within the last six years, eight Holstein cows have produced more than 1,000 pounds of butterfat, when milked three times a day for 365 days. The importance of this accomplishment may be seen in the fact that only about 70 cows in all Holstein history have done as well under the same conditions.

In the Jersey herd, 74% of the last-generation females have produced over 700 pounds of butterfat. The other 26% produced more than 500 pounds.

Careful Cultivation Means More Corn

How many bushels of corn do you lose each year through careless cultivating?

If you are an average operator, you probably knock out at least 10% to 15% of your stand. You can figure out what that does to your field.

L. L. Huber, a corn specialist at Pennsylvania State College, has come to expect a 15% to 20% reduction in stand from the planting rate. Not all of this is due to cultivation, but much is. Workers in Huber's test plots are always cautioned to drive slow, and this holds down the loss.

A farm boy operating a tractor cultivator on a Saturday afternoon can do more damage to a field than all the insects, birds, and diseases combined, Huber contends. And he doesn't excuse father, either, who may be in just as big a hurry to get through.

The big trouble with high-speed cultivation is covering plants. Then, of course, keeping the shovels deep in later cultivations is a sure way to prune much-needed brace roots.

—Farm Journal

New Horizons in Nutrition

Condensed from The Shorthorn World

Dr. H. J. Prebluda
The National Farm Chemurgic Council

Food and feed are closely related. During prehistoric days man had a difficult time obtaining nutriment from wild fruits and herbs. It was not too long before he discovered that it might be easier to make use of animals who could graze widely and change vegetable protein feed to animal protein food for his personal use while he engaged in more leisurely activity. From that time on he became primarily a meat eater. As we compare the near prehistoric days with the present era, we find that the business of agriculture was and still is the world's most important industry. Over two-thirds of the man power throughout the world is engaged in devoting some form of its energy to the growing, gathering and distribution of food so vital to life.

With new inventions and technological progress in the physical sciences as a result of war activities, the agricultural horizons have been so broadened that the same soil area can produce a greater yield with decreased human effort and time. Agriculture has taken a firm hold of these achievements so that most of its people are now trained in modern methods and alerted to new developments.

Many new discoveries have been reported in the field of animal nutrition during the last year.

The commercial acceptance of hybrid corn introduced a little over ten years ago has done much to increase yield especially during dry periods. American feeders have never given their livestock adequate protein in proportion to carbohydrate feed. This condition is paralleled in human nutrition. On an oilmeal equivalent basis only 7.5 million tons of oilmeals and animal protein are available annually in the United States for feeding purposes. There is tendency for a lower protein content of hybrid corn. The textbook of values of 9.3 to 9.8 percent protein in corn already are out of date. This is reflected by the lower protein content of corn by-products such as distillers grains and solubles compared to higher values previously accepted by the

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feed trade. As time goes on, increased quantities of protein will be necessary to compensate for the lower protein trend of corn brought about by acceptance of hybrid varieties. It is interesting to note that about 80 percent of our corn stays on the farm, whereas 20 percent of the corn produced is sold. Approximately half of this latter quantity is returned to agriculture in the form of commercial feeds.

In examining the protein situation more closely we find a production inter-relationship between protein and fat of feed ingredients which has a bearing on animal nutrition. As an example of this, technological changes are taking place in processing oil bearing seeds. It has been found that solvent extracted meal yields a protein product with a lower fat content. This is of importance inasmuch as feeds with low fat content have an effect on production. Within certain limits the higher the fat content of a concentrate mixture, the greater the efficiency and total digestible nutrients for each pound. Inasmuch as there is at present a great market demand for fat to be used either industrially or for human food, the feed industry will have to depend either on high fat content materials derived from sources other than oil seed meals or consume more feed to compensate for the lower energy values. Work at Cornell University has shown that fats added to feed after extraction from oil bearing seeds have much less value than equivalent quantities of fat existent in the natural feeding stuff. This means that the parent oil bearing seed contains something other than fat which is necessary for full utilization of this nutrient.

The by-products resulting from the use of fermented cereal grains in the distilling industry are very high in fat and protein. One should not overlook the fact that there is a percentage of good quality yeast protein present in the distillers solubles. In time these chemurgic products will play a more important role in both home mixed and manufactured feed. The reasons for their stimulating influence upon production are not quite known. There seems to be an unrecognized factor in distillers products favorably affecting production. It has been noted that the increase in production is greatest when, during the manufacture of these grain by-products, quantities of thin stillage are dried along with the coarser screened spent grain mash. This latter product is referred to as "dark grains" or dried distillers grains with solubles.

Supplements containing a large percentage of fermentation by-products produce high quality

beef with excellent grade ratings. The reputation of distillers products will, in time, become established as soon as manufacturers can assure the industry that their products have uniformity both with regard to appearance and nutritive value.

As in the case of distillers grains and solubles the by-product meal obtained from extraction of oil bearing seeds was not fully appreciated until wartime necessity forced the industry to use more of these in place of animal by-products. Soybean meal was a life-saver during the critical emergency of protein shortage. There is a great future in store for this protein in balancing our carbohydrate feedstuffs. Animal protein will be limited in production to the amount of livestock brought to market. Production of marine protein is restricted by limitations of weather and available fish. Decrease in cotton production will cut the potential of available cottonseed meal. It should be mentioned that linseed meal crushing has gained during the war period but its total tonnage does not appreciably influence the protein picture. Linseed meal has found favor in feeds for cattle because of the presence of a slimy carbohydrate material called "mucin." The latter has great capacity for absorbing water and plays a role in regulating digestion.

Since the oil seed meals have become more widely used in livestock rations greater attention has been given to the protein and amino acid makeup of these ingredients, especially soybean meal.

Millions of dollars are lost annually by the meat packing industry because of faulty or damaged livers found after slaughter of farm animals. There is hope that the sulfur amino acid, methionine, may prevent this condition. In work with humans, methionine has been indicated where there is loss of body nitrogen such as in the case of shock, exposure and burns. It has also been recommended in human therapy where there has been liver damage as a result of poisoning from certain organic compounds.

Minerals are inter-related with the formation of vitamins, enzymes, hormones so necessary for life. For example, it has been found that an excess of manganese plays a supplementary role when vitamin D is present in poultry rations in sub-optional quantities. Older hens require almost twice as much manganese in laying rations as do pullets during their first year of production. Work at Washington State College has indicated that manganese deficient rations result in poor quality bull semen.

In some instances the soil has been depleted not alone of micro-

nutritients but of major mineral ingredients because of too much one-way traffic in mining the soil. In order to continue getting new riches from the soil, one must return something to continue satisfactory crop production. The lack of essential elements is passed on through plants and animals to people. Evidently the soil cannot give up to plants important nutriment that is not there. Some geographic areas have been short changed by nature, so that man has either to supply the plant or the animal with additional minerals for proper nutrition. In certain geographic areas natural excess of some minerals does harm. For example, the people in the Buena Vista Lake area have noticed a graying of the coat in cattle, accompanied by a persistent scouring and anemia. The condition has been especially aggravated by alfalfa hay from this area. It was traced to an excess of molybdenum in the soil which indirectly caused poisoning of the cattle.

Some new trace elements now are being studied in Great Britain where it has been indicated that nickel is of importance in increasing crop yield. Inasmuch as food and feed are closely related to soil nutrition it is possible that a more important role will be found for nickel as has been shown during the last year with the addition of cobalt to the feed of ruminants.

Sometimes natural products supplying primarily the same minerals to animals seem to perform differently. Cornell University research has shown that oyster shell or calcite grit is much superior to ground limestone as a supplement for laying rations.

Feeding tests have shown that it is most important to have proper feed intake during the dry period of the cow. The feeding of natural feedstuffs or high vitamin A concentrates to dry cows has a tendency to benefit economically the new born calf. Vitamin A deficient rations in livestock feeding have become a major winter problem. One way of getting around this type of deficiency has been the use of good quality alfalfa. Preliminary experiments at Ohio State University indicated that 1,000,000 units of vitamin A, daily, for one month, prior to calving were suggestive of positive results for the prevention of milk fever.

We are becoming gradually alerted to the ease of destruction of vitamin A. Antioxidants show promise in stabilizing this vitamin which seems to lose its physiological potency not only in ingredients prior to being placed in feed, but after being shipped to the consumer, so that the final feed contains but a small fraction of the

vitamin thought to be present by merely adding the vitamin A textbook values of the constituents.

A great deal of vitamin A comes from grasses which are so commonplace and are taken too much for granted. Progressive agriculture could not be possible without well managed pastures. Harvested roughage provides the backbone of winter rations. It has been found that carotene has greater stability in grass silage than in dehydrated or sun-cured alfalfa. Alfalfa meal when stored in burlap bags has a tendency to lose 80 percent of its carotene potency in one year.

There is a close inter-relationship of vitamin E and vitamin A. The fact that antioxidant properties of vitamin E protect vitamin A from running down was not too well appreciated until a few years ago. This may be also correlated with investigators' findings that virtually the same physiological defects have been attributed to vitamin A and E deficiencies of animals. These two vitamins work together in all tissues in a sort of cooperative, protective and nutritive capacity. Vitamin E not only stabilizes vitamin A but makes it more available.

Recent work at the Minnesota Experiment Station in connection with the nutrition and reproduction of cattle has shown that sudden death occurred among both sexes of animals from eighteen months to five years of age. Using an electrocardiograph, the same instrument which is used to study heart conditions in humans, it was found that dramatic heart failure was produced by vitamin E deficient rations. This work undoubtedly will create new interest in the inter-relationship of vitamin A with vitamin E which often is referred to as alpha tocopherol. "Stiff lamb disease" has been shown to be indicative of vitamin E deficiency and can be prevented by including wheat germ meal or other sources of this vitamin.

In the field of hormones there seems to be a bit of disagreement and skepticism. Nevertheless research is making progress through the organic synthesis of low cost compounds which affect the metabolism of warm blooded animals. These compounds have a hormone-like action in that minute quantities can produce great changes in natural processes, especially growth and fat deposition. Some of the materials such as thyroprotein behave through the stimulation of the thyroid. Another group of compounds such as thiourea and thiouracil inhibit thyroxine secretion in the thyroid. Because of the resulting decrease in metabolism there is usually an increase in feed utilization upon administration. The limiting factors in the use of anti-

thyroid agents is their lack of palatibility to farm animals. Bovines need salt to mask the taste. Although most swine and sheep object to the taste of the thiouracil or thiourea, the carcass quality is improved greatly upon administration of these compounds. In working with cattle it was found that ingestion of these materials did not affect significantly the degree of finish.

Another series of compounds having hormone action is called the "estrogenic group." The estrogenic hormones are primarily behavior hormones of females and are responsible for some of the differences which characterize a hen from a capon. Administration of estrogens increases the fat content of the blood and causes deposits of fat under the skin. It is, therefore, possible to feed these compounds to poultry so that regardless of age or sex the birds take on a soft, glossy skin finish which is characteristic of "milk fed" birds.

In reviewing the advances made in animal nutrition during this past year, one cannot help but notice the increased dependence of the minerals, vitamins, amino acids, enzymes and hormones on one another in the greater physiological process of metabolism.

We wonder as we gaze away from horizons of new achievements in animal nutrition whether our standards of human nutrition even approach those designed by science for animals. Although Chemurgy pertains to the use of farm products by industry one cannot help but realize the interrelationship of nutrition with industrial production. There are millions of people within the borders of our country whose production capacities could be improved with proper nourishment. Improved human nutrition not only in the United States, but throughout the world, will provide enormous new markets.

Hydrated Quick Lime for Poultry Litter

Condensed from Farm and Home Research

D. C. Kennard and V. D. Chamberlin
Ohio State University

With the rapidly increasing use of lime in connection with built-up floor litter in brooder and laying houses, many poultrymen face the question of which kind of lime to use.

Hydrated lime in 50-pound bags is most commonly used and the different grades may be purchased from building supply or feed, seed, and fertilizer dealers under trade names such as Agricultural hydrated lime, Mason's hydrated lime, General Purpose hydrated lime, or Finishing hydrated lime. Any one of the products may be used, so the choice can be determined by cost.

Theoretically, quicklime, being more active chemically and having greater capacity for absorption of moisture would be expected to be more effective than hydrated lime for treatment of floor litter. Practically, quicklime has been little used because it is seldom available and if available, it is in the lump form and ill-suited for scattering over the floor litter. Moreover, there may be a fire hazard in connection with the use of lump quicklime.

However, pulverized quicklime is now available in sealed bags and can be used much the same as hydrated lime. Being in pulverized form, there is little fire hazard involved in its use. It is easily scattered and stirred into the litter without large amounts of lime being concentrated in one place.

It was interesting to observe an experiment which was conducted at the Ohio Experiment Station's Poultry Plant at Wooster in which there were three adjoining pens of layers on builtup wood shavings floor litter, started the first of October, 1947.

In the pen without lime added, the floor litter appeared damp and in poor condition (January 1948). In the adjoining pen with the built-up floor litter to which hydrated lime had been added, the floor litter was in good condition. In the third adjoining pen, however, the floor litter to which the pulverized quicklime had been added was in slightly better con-

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dition than that of the floor litter which had been treated with hydrated lime. The condition of built-up floor litter is usually judged by its appearance. It is considered in good condition when dry and in poor or bad condition if damp or wet. When the floor litter without lime appears damp in comparison with litter to which lime has been added, it is a matter of appearance only, according to tests conducted by the Western Washington Experiment Station. In these tests little or no difference in the actual moisture content was found whether or not the litter had been treated with lime. What lime does, however, is change the physical condition of the litter so that it becomes friable and more absorbent. This gives the litter the appearance of being drier and in better condition.

The calcium content of pulverized quicklime is greater than that of hydrated lime and the price of the two products is usually about the same. Hence, there is an economic advantage in the use of pulverized quicklime in many instances where the floor litter can be credited with a calcium value for soil fertilizing purposes.

It should be emphasized that the pulverized quicklime has as yet not been used by the Station in the floor litter for chicks. It has been observed that hydrated lime may have a slight caustic effect upon the feet of the chicks under certain conditions. Consequently, the hydrated lime needs to be carefully distributed over the floor litter for chicks and stirred well into the litter at once. Since pulverized quicklime is still more caustic than hydrated lime, correspondingly greater precaution will need to be exercised when pulverized quicklime is used in the floor litter for young chicks.

How Long Is Furlong?

The racing term "furlong" (one-eighth of a mile) originally meant "furrow-long." The furlong represented the distance which oxen could conveniently plow at a stretch, and over which the plowman could keep a fairly straight line. This measurement was used by the primitive Celtic tribes of Britain, who divided their fields into strips, each a furlong in length, and allotted five strips to each free tribesman.

Marketing Begins in the Field

Condensed from the American Fruit Grower

H. B. Tukey
Michigan State College

MARKETING fruit is a "grass roots" problem. It begins when the trees, vines, and berry plants are set. Some of the marketing problems of 1947–48 began 30 years ago when the wrong sites were selected and the wrong varieties were planted. Many more of those problems arose in the pruning, fertilizing, spraying, and harvesting operations during the growing season of 1947.

It is because the quality of the fruit offered for sale is so important that it is natural and proper for growers' meetings on advertising, grading, merchandising, and pricing often to settle down to matters of production, although fruit growers have been criticized for doing so. If there is a good grade of a desired product to sell, there is little or no trouble in selling it; but when the product is inferior and undesired, the producers are left begging for help.

This is a point too often overlooked because the producer too frequently fails to carry the product of his efforts clear through to the consumer's hands. It is as though an automobile manufacturer were so busy pushing cars off the assembly line that he forgot to follow through to the consumer. If the producers of fruit could know the desires and the reactions of the consumer, many of the problems which originate in production would be close to solution. There ought to be more consumer surveys made by producers, and more producers should visit markets to see what the produce looks like when it is offered for sale.

The biggest need in the fruit business today is an orderly, regular supply of uniform, high-quality fruit. To achieve this, the first step is selection of the variety itself. Considerable progress has been made in the last 25 years in standardization of a few successful varieties and in the elimination of others. The McIntosh variety now dominates eastern apple production; the Delicious commands the over-all production of the nation; and about half of the apple production of Michigan is of the three varieties: Jonathan,

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McIntosh, and Northern Spy. However, there are still too many old varieties cluttering the scene. Reduction of their number would mean further progress.

There are, of course, times when a wide assortment of varieties is desirable, as in local and roadside trade. Operation and sales can be spread over a long period by growing a succession of quality fruits. Such a plan is helpful to the marketing of fruit in general, especially if the product is of high quality, ripe, and attractive. The best advertisement for apples is a good apple. Inferior produce should be eliminated from the tourist and roadside trade, and in its place should go the best.

An integral part of the variety situation and its effect on market supplies is the tendency of some varieties toward biennial bearing. The trend toward the planting of annual producing varieties such as Jonathan, Delicious and McIntosh in place of York, Sutton's Beauty, Tompkins King, Baldwin, and other biennial-bearing varieties is sound; yet how to get annual production from biennial-bearing varieties already planted is still a major problem. We know that blossom thinning will help if done in the "on year." We withhold or reduce spring nitrogen applications in the "on years" and we prune more heavily in the "on year." But the final answer still lies with the plant breeder in the origination of varieties that tend to bear annually.

Then there is the matter of planting the variety where it grows at its best. Grimes Golden and Stayman in the North are pitiful products. McIntosh is nearly worthless in the South. Elberta peaches on heavy soils in a region of cool seasons are a depressing influence. The Concord grape develops poor quality in a short, cool season. Varieties of peaches ripening earlier than Elberta, such as Redhaven, Golden Jubilee, and Halehaven are preferred for regions where Elberta does poorly because of short seasons.

The selection of variety is conditioned by market outlet as well as by suitability to the region. Small Jonathans are not a happy answer to a neighboring canner who needs large size if he is to stay in business. White-centered strawberries meet hard competition from solid red varieties when the outlet is the freezer. Small Kieffer pears are not wanted at the cannery any more than are poorly-colored McIntosh on the fresh fruit market.

Harvesting is an operation in itself which can spell success or failure in marketing. Too much fruit is harvested prematurely. Delicious apples are often harvested so early that they store

poorly and are of low quality. If harvested too early, some varieties of apples may scald; if harvested too late, they break down in storage. Green peaches never ripen properly. Pears picked too late become soft at the core and break down. Too-heavy application of nitrogen results in premature dropping of McIntosh, and this situation is frequently met by picking too early.

Handling, which is really a part of harvesting, is becoming the limiting factor in getting fruit to the consumer in good condition. Records on peaches and apples show up to 60 percent bruising on occasion. There is little more that need be said at this point because the answer is so obvious—namely, careful handling. This means short finger nails, padded baskets and graders, placing instead of pouring, proper packing, springed vehicles, and smooth transportation. Most of these things are well-known, but difficult to correct or overcome.

An interesting report issued by the New York and New England Apple Institute in the spring of 1945, and still sound, gave eight reasons for marketing problems during the 1944–45 season. Of these eight, four were production problems, as follows: 1. Blind hope that tree-run apples could be sold readily; 2. Demand only for apples of size and quality; 3. Lack of desirable size, color, and quality of an unusual percentage of the crop; and 4. Wretched appearance of apples in many stores.

A recent booklet by the Washington State Apple Commission, entitled "Factors Affecting the Condition of Apples" spends considerable time on the effect on quality of fertilizers, pruning, thinning, spraying, and picking. It is all a part of the new program of recognizing that marketing is a "grass roots" problem.

The House Fly Can Be Eradicated

Condensed from The Southern Planter

David G. Hall
U. S. Bureau of Entomology and Plant Quarantine

THE advance of science has brought a new freedom in the comforts of rural living. This is due, almost entirely to the insecticide, DDT. Within the past few years DDT has become a standard household product. Through the vigorous campaigns of the U. S. Department of Agriculture, the Extension Service and other agricultural workers cooperating with Federal, state, and county health departments, farm people have learned how and when to use DDT to protect their homes and livestock from the annoyance of the housefly.

DDT spraying was first undertaken in areas with a high malaria incidence during the late summer of 1945. The reduction of flies was one of the most obvious results. DDT became available for general public use in 1946.

Fighting flies is nothing new. This fight between flies and man is nearly as old as civilization. But the new and modern methods of waging this kind of warfare have given man the whiphand at last. DDT is nearly the perfect answer to the housefly problem when it is properly applied.

But DDT must be applied to the right places in the right amount if it is to do a good job. It must be applied to the places where flies crawl and rest. You must spray it on such surfaces in a coarse spray, then let it dry. The insects crawling about on such treated surfaces pick it up on their feet—and die.

To do a good job against houseflies, you must look for the places where the flies congregate in the daytime and where they rest at night. Favorite spots are on back porches, about garbage cans, under the eaves of milk houses, inside open barns, places where cattle are fed, about stables, on fences around pig lots, on walls about places where manure is stored, and around garbage dumps. You won't find many flies on flowers, shrubs, grass in pastures, or on crops in fields.

When you have decided where DDT can be applied to kill the most flies, spray a liquid containing 2½ to 5 percent DDT on

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such places. Spray enough of the liquid on the surfaces so that they are wet, but not so much that there is excessive run-off and waste.

You many want to use a regular household spray composed of a refined kerosene and DDT or a water emulsion DDT preparation for surfaces inside homes. Such preparations leave very little or no traces of the residues of DDT. They are very satisfactory, and can be obtained from almost any farm supply dealer, drug store or grocery. Just be certain that the preparation you buy contains the proper amount of DDT.

Outside homes, or places where traces of the whitish DDT residues make little difference, you can use powder containing DDT that you can make into a liquid by adding the powders to water. These wettable powders can be purchased from seed stores or agricultural supply houses. The powders usually contain 50 percent DDT. Follow the directions given on the label to make a spray containing 2½ percent DDT. Such wettable powders leave thin traces of whitish residues and some people object to their use in or about homes. But they are perfectly satisfactory, and less expensive, on barns, fences and the like.

Make your applications early in the spring. The more flies you kill then, the fewer you must kill later on in the summer. It will be necessary to apply the DDT but once each season to enclosed and protected places. Surfaces in the open must be treated several times. Rains will wash the DDT away and sunlight appears to affect the killing power of the insecticide.

Fly and mosquito eradication really got its first big start in the Pacific during the closing days of our recent fight against Japan. Everyone knows now how entire islands were made fly-free, and mosquito-free, in 1944 and 1945.

Far-seeing entomologists started in 1946 to rid communities of flies here at home using the same methods as the Army did in the Pacific. They enlisted the aid of public-spirited citizens, sometimes whole communities, and in a few instances, entire states.

In only a few months, these people saw what a little effort, and a lot of community-spirited cooperation could do. Localities notorious for plagues of flies, went through the summer without these insects.

Actually it's rather simple for a community to become free of flies. All it takes is leadership with a spirit of wholehearted cooperation on the part of the people who live in the involved area.

Service organizations, such as a Chamber of Commerce, Lions Club, Rotary Club, Kiwanis or PTA, have found few more worthwhile projects than a public service endeavor such as this. State health departments, state agricultural extension services, or state extension entomologists can usually furnish complete plans on how to go about it.

Farmers often find it possible to reduce the numbers of flies about their properties without the help of their neighbors. But most satisfactory control of the pests over wide areas is obtainable only through coordinated efforts in which all people in the vicinity share.

By "fly eradication" entomologists mean the destruction of the last individual fly in an area. They do not use these terms when they discuss an insect control project which may not kill the very last insect. But entomologists now think housefly eradication is possible in great areas with DDT.

It takes community effort to do this job and a number of public-spirited citizens are required who are willing to see that the job is done.

Cattle-Breeding News

If you are breeding (or feeding) beef cattle, here are three facts to paste in your Stetson:

1. The conformation, or build, of an animal is not related to his ability to grow and gain.

2. That ability to grow and gain fast is very much inherited.

3. Conformation is influenced by heredity, but to a much less extent than is growth.

That's what 12 years of beef-breeding work at the U. S. Range Livestock Experiment Station at Miles City, Mont., show.

If you're an old-time beef man, you'll probably find the first statement a little hard to swallow. Bradford Knapp, Jr., of the Range Station explains it this way:

A Holstein steer may gain just as fast as a Hereford, but he does it differently. Most of the gain comes from an increase in the size of the skeleton and muscle, with little fat. The Hereford does not grow as big a frame, but he fattens more readily. A long-legged Hereford may gain just as fast, and fatten as well, as a short-legged one. The point Knapp makes is that growth and gaining ability are one thing, and conformation another. They are not associated. Both are inherited, but one is not a measure of the other.

—Farm Journal

The Dairy Sciences in Great Britain

Professor H. D. Kay, F.R.S.
Director of the British National Institute for Research in Dairying

DAIRYING is one of the largest industries in Britain. Modern dairying covers, and dairy science is therefore intimately concerned with, first, the production on the farm and the transport, processing and distribution of immense volumes of milk of high keeping-quality and nutritive value for consumption as *liquid* milk. Second, it is concerned with the large-scale manufacture of dried and condensed milk, of cream, butter, cheese, ice cream and a hundred and one by-products.

Industrial dairying, as we know it today, is of very recent development. It is, in fact, less than seventy years ago that the steady accumulation of knowledge as to why milk went sour, and how to prevent that souring by care in handling and by heat-treatment, made it possible to effect the large-scale distribution of liquid milk to the rapidly increasing urban population. There had been, indeed, an intermediate stage of so-called town dairies—herds of cows kept, often under appalling conditions, in squalid cowsheds in the middle of large towns—from which unhygienic milk was distributed, before it became sour, to domestic consumers in the immediate locality. There had also been a fairly long period, still in fact not completely past, of small-scale *farm* manufacture of butter and cheese. On the other hand, the condensing and drying of milk, whereby practically the whole of its nutritive value can be conserved for months—even, by modern technique, for years—was never a farm process.

How large is the dairy industry in Britain? At the production end, some 1,600,000,000 gallons of milk, derived from a population of four million dairy cows and heifers in milk or in calf were produced in the United Kingdom during 1946, the latest year for which I have complete figures. Some 60% of the farmers in the U. K. are dairy farmers, and more than half the *total* income received on all farms comes from the sale of milk.

The growing demand in Britian for high-quality milk, mainly for liquid consumption but partly for the manufacture of high-grade dairy products, has entailed the increasing application of science to the whole industry. As regards

milk production, not only have the breeding and management of high yielding cows, and the growing of crops suitable for the feeding of such cows, been steadily improving, but the findings of modern physiological, nutritional and veterinary science have been more and more widely applied. Thus in applied physiology there is the successful use of artificial insemination with its great potentialities for a rapid increase in the quality of dairy stock; in nutrition there is the skilful balancing of digestible carbohydrates, proteins, fiber and minerals in compound feeding stuffs, which has enabled potentially high-yielding cows to give their maximum output without loss of condition; in veterinary science we have the control of contagious abortion by vaccination. Bacteriology has been successfully applied alike to the improvement of cowshed technique, to methods of cleansing and sterilizing milk equipment, and to increasing the keeping-quality of milk. A combination of bacteriological knowledge and engineering skill has made possible the modern high-temperature, short-time milk-processing plant, with its automatic controls, and its dual function of making milk safe and giving it an increased keeping-quality. Nor is dairy engineering confined to the large-scale plant: on the farm we have mechanical milking, mechanical cooling and other engineering developments.

As regards milk products, bacteriology has been successfully applied to the production of high quality cheese. Of recent years, a discovery, first made in New Zealand, that starter organisms, so necessary for the production of high quality cheese, were often readily destroyed by a sub-microscopic virus or bacteriophage, has been turned to good account in Britain.

Physical, sometimes called rheological, methods are now beginning to be applied both to the control of cheese-making and to the assessment of the quality of the finished cheese. In butter-making, engineering and physics have given us the continuous process, which in time will doubtless supersede the cumbersome churn. Engineering, bacteriology, and careful physical and chemical control, are all very closely concerned in the making of dried and condensed milk, a recent example being the change in pre-heating temperature, by which the keeping quality of spray-dried whole milk has been increased by some three or four times.

I have sketched in this background, because I wish to make it clear that for almost everyone engaged in the dairy industry, both a good basic education and, also specialist training are be-

coming a necessity. For the efficient dairy farmer—efficiency is essential if the limited agricultural acreage of Britain is to be used to the best advantage—a sound background of basic science is an indispensable part of his stock-in-trade. This is no less necessary for the efficient milk distributor or manufacturer. Improvements in quality of liquid milk and dairy products are continually being called for, new ideas are entering the industry from all sides as the result of scientific and technological research, and those in any position of responsibility must be properly equipped to understand and apply them.

Courses for a degree in agriculture, all of which give much time to dairy farming, may be taken at eleven Universities in the United Kingdom. An advanced (post-graduate) diploma in Dairy Husbandry has recently been established at the University of Reading.

Several agricultural colleges and Universities train students for the examination for the National Diploma in Agriculture or the more specialized National Diploma in Dairy Husbandry. Either diploma requires a fair training in agricultural science, together with a year of practical experience on an approved farm. Formerly there was a single National Diploma in Dairying which covered both the farming and the industrial side, but quite recently this Diploma has been replaced by two, the Husbandry one just mentioned and a National Diploma in Dairy Technology. A requirement for the latter examination is *either* a period of twelve months in a dairy factory *or* six months in a town milk processing plant, together with six months during the operating season in a country milk manufacturing plant.

There is at present only one center in Britain where a *degree* in dairying may be obtained. This is the University of Reading, where a three-year course provides not merely vocational training at a satisfactorily high level, but also a University education in the wider sense. Some of its graduates are already in managerial and senior laboratory posts in the industry, and in course of time there is little doubt that a large proportion of such posts in Britain will be occupied by men or women with a good University education and high standards of professional competence. The proposed establishment at this University in the near future of a well-equipped Institute of Dairy Technology, where not only undergraduate students but others requiring advanced specialist training in modern processing and manufacturing aspects of the industry will be provided for, will mark a substantial

move forward in education in dairy science in Britain. Post-graduate research in dairy bacteriological problems will form a feature of the work of this Institute.

As regards research in dairy science, there are two main centers in Britain, the National Institute for Research in Dairying at Shinfield associated with the University of Reading and the smaller Hannah Dairy Research Institute at Ayr in Scotland associated with the University of Glasgow. Both Institutes deal with the fundamental aspects of science in relation to dairying and also with the more immediate problems arising in dairy farming and industrial practice. The names of the seven departments at the National Institute give a fairly good idea of the fields of research covered. They are:—(1) Dairy Husbandry, dealing with the problems of cropping, breeding, milking technique and dairy farm management generally (2) Feeding and Metabolism, concerned with the fundamentals of bovine nutrition (3) Lactational Physiology, dealing with the physiology and biochemistry of reproduction and lactation (4) Bacteriology, dealing with the main aspects of science which enter into milk production, processing and manufacture (5) Chemistry, concerned both with chemical and physical aspects of milk and milk products (6) Nutrition, dealing with the factors that influence the value of milk as a foodstuff (7) Dairy Machinery, dealing with the problems associated with the rapidly increasing use of machines and special appliances both on the farm and in the industry. The Institute founded, and is still closely associated with, an artificial insemination center. The British Commonwealth Bureau of Dairy Science is housed by the Institute.

Neither this Institute nor the Hannah provides undergraduate training, but a limited amount of accommodation is available at both Institutes to enable suitable post-graduate students from home and abroad to undertake advanced study and research. Such students may proceed to M.Sc. or Ph.D. degrees.

The best training for dairy *research* is probably an honors degree in a basic science, followed by practical acquaintance with one or more branches of the industry, but the real prerequisite for a successful research worker in dairy science or in any other branch of science, pure or applied, is, of course, an inherent flair for investigation. If present, it can be developed by training and hard work, if absent, no amount of study or outside assistance will be of much avail in producing a genuine research man.

New Containers for Shipping Peaches

Condensed from New Jersey Farm & Garden

THREE packages for shipping ripe peaches to market were tested out last season by the N. J. Experiment Station in cooperation with the Beverly Cooperative Association and the Burlington Extension Service.

Ripe peaches were packed by Charles Heal, of Burlington, chairman of the Beverly Cooperative packaging committee, and consigned to a commission merchant at the Washington Street Market in New York City.

The test was staged in an attempt to find a container which would carry superior tree-ripened peaches to a fairly-distant market without undue bruising. Most modern packages are satisfactory for shipping hard fruit but are not adapted to handling ripe peaches.

One of the containers was a cell-type package made of heavy cardboard with individual cells for each peach. Although not new, its use for peaches is in the experimental stage. The fruit is packed somewhat like eggs in an egg box. The box comes in two sizes—one with 120 cells for 2¼-inch peaches, and the other with 96 cells for 2½-inch peaches.

The second type, a half-bushel cardboard package without cells, is especially strong in construction to withstand rough handling. It is a shallow oblong box designed to prevent damage which usually occurs to peaches on the bottom layer.

The Spartan box, a wire-bound crate with heavy paper lining, was the third type tested. This oblong crate can be quickly assembled and the lid fastened without the use of nails. It is light but strong.

A representative of the Experiment Station inspected all shipments as they arrived at New York City and also followed as many as possible through to the retail markets.

Following are the conclusions of Joseph F. Hauck, Rutgers marketing specialist, who was in charge of the test.

1. Firm tree-ripened peaches can be shipped successfully to New York and other markets if properly handled and packaged.

2. The cell-type container proved best of those tested, and if improved in some ways will undoubtedly carry firm-ripe peaches with a minimum of loss. It was the most satisfactory for controlling brown rot and had the fewest bruised fruit. However, bruised fruit was found on the top layer, caused by forcing on the lid. Some cartons bulged and lost

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shape by the time they reached the retail stores. The container needs to be ventilated, it should be reinforced to prevent sagging, and more space is needed between the top layer and the lid.

Another criticism of the cell-type box was that it holds three-fifths to five-eighths of a bushel, depending on the size of peach packed. Consideration should be given to developing a package that holds a half-bushel, a measure commonly used in selling peaches and more acceptable to the trade.

Cartons with larger cells for the 2¾- and 3-inch peaches are also needed for the fancy trade.

3. The Spartan box looked good on arrival at the commission house and was popular with the trade. Firm-ripe peaches carried fairly well in this container. Some fruit on the top layer was bruised, but such injury was not serious. Damage to the bottom layers was more pronounced. Peaches on the soft side of firm-ripe should not be shipped in this package.

This box does not prevent the spread of brown rot and on several days a number of peaches with this disease were found.

4. The half-bushel cardboard box was the least successful of the three. Little provision for ventilation has been made and brown rot was a problem in several shipments. Peaches were sometimes bruised by contact with the cover and the bottom. The top layer, in particular, often suffered. One advantage of this package, however, was its snap-on lid which made it easy to display the pack in the commission house.

How Force Molting Works

Condensed from Poultry Tribune

Fred Frazier
Extension Poultryman, State College of Washington

SUMMER force molting of yearling White Leghorn hens for commercial egg production is quite common and profitable on Washington State poultry farms. This practice started in 1932.

There are several reasons why force molting of yearling hens has become popular. In the first place, poultrymen were having a hard time keeping early hatched yearling birds laying into the late fall and early winter. And too, they wanted to find a way to make more money on their original investment of baby chicks in a

Reprinted by permission from the Poultry Tribune, Mount Morris, Illinois, May, 1948

shorter period of time. Force molting proved to be the answer to both these problems for the commercial egg producer.

In a force molt program, all of the birds are molting at one time, at the beginning of summer. This is when eggs are low in price and egg quality is down. After the birds are molted, rested, and back in lay, higher egg production with better quality eggs is secured during the winter months. This is during the period when egg prices are at a seasonal high and most favorable to poultrymen.

Poultry farm records kept by the State College of Washington Extension Service show that the profits are higher from force molted flocks of White Leghorn hens that those of a similar age, but not force molted.

Experiments conducted by the Western Washington Experiment Station at Puyallup show that summer force molting of yearling hens resulted in the production of eggs that have more nearly perfect shells which will grade from 25 to 35 percent higher than from a flock of birds that have not been force molted. Many poultrymen with flocks of force molted Leghorns report that they get 90 percent extra grade market eggs.

Poultrymen who have limited housing facilities can frequently make better use of their poultry houses by keeping their force molted birds until one month prior to brooding season and then disposing of them. This is usually done where one house is more or less isolated from the others and can be used as a brooder house as well as a laying house.

One reason why poultrymen don't force molt their yearling hens is the loss of income during the pullet rearing season. This loss of income for a period of 8 to 10 weeks is a disadvantage. The increased income from more and better eggs in the fall and winter, however, easily outweighs the one main disadvantage of loss of income during the summer.

The majority of poultrymen who force molt make a success of it. Some do not. Those who do are the ones who follow the outline of procedure carefully and meet certain requirements. They use only yearling birds hatched before April 1. Later hatched birds do not do so well. They use only hens that have been good layers. They cull any birds that show signs of disease or internal parasites.

The majority of the birds in the State of Washington that have been force molted are White Leghorns. Some poultrymen have tried the heavy breeds, but they report that it has not been too successful. A number of poultrymen have also reported that well-managed, high-producing, two-year-old Leghorn hens in good physical condition have been successfully

FORCE MOLTING INCREASES LABOR PROFIT PER BIRD

	Fall egg lay of hens	Egg production per hen	Mortality of hens	Labor income per bird in 1937
	Percent	*Number*	*Percent*	*Dollars*
Force-Molted	52	168	16	1.16
All Flocks	32	154	18	.77

force molted for a second time. The figures in the table give a comparison of force molted hens with hens that were not force molted.

The period between June 1 and July 1 is the best time to start the summer force molt program. Frequently, poultrymen who try the force molt program for the first time report that their results were not too successful because they were a little too "chicken hearted."

A force molt program requires strict attention to a few details in order that it will work properly. For example, the birds must be forced out of egg production as rapidly as possible and caused to drop their feathers as quickly as possible.

In order to get the birds out of production, it is necessary to confine them to a house, or a house and sunporch, allowing them at least 4 square feet of floor space per bird. The mash is removed from the house and the water is turned off for 36 continuous hours. After this, the birds are given water for only two hours a day, each day until production takes a drastic drop. This will usually require from 7 to 10 days. It is important that enough drinking space be provided so that all of the birds may get a drink during the two-hour period when they have water.

It is advisable to be on the lookout for any signs of picking when carrying out this program. If picking becomes a problem, it will be necessary to take appropriate steps.

The only feed which the birds get is grain, and this is fed at the rate of 6 pounds per 100 birds per day for the first five days and then 8 to 9 pounds daily throughout the rest of the molting period. It is usually advisable to feed them grain in three equal feeds. If the birds are thin, increase the grain; if they are overweight, decrease the grain. It is also important that the equivalent of 0.4 pounds (approximately ½ pint) of 400 D-1,000 A vitamin carrying oil be added to each 100 pounds of scratch grain that is mixed.

If green feed is fed, it is given at not over 2 pounds per 100 birds per day. During the molting period, no milk or artificial lights should be used. Hard granite grit and limestone or shell should be kept in hoppers. Any birds that fail to molt are usually separated from the flock and given another molting schedule, until such time as they begin to molt.

Successful poultrymen using this

program have found that the molting period usually takes from 15 to 23 days. Feathers will usually start to drop in 10 to 15 days after the mash and water are first removed. Many poultrymen report less than 1 or 2 percent egg production at the end of 10 to 12 days after the program is started.

The second stage is known as the resting period and starts after the feathers have dropped and continues until at least the end of the eighth week. The birds are usually allowed out on clean range with all of the succulent green feed that they can eat.

Three pounds of wheat bran or mill run are usually fed per 100 birds per day. If it is impossible to obtain wheat bran or mill run, 2 pounds of an ordinary laying mash can be fed to the 100 birds per day. Again it is important that all of the birds be given an opportunity to eat when the feed is put out before them.

The vitamin A and D oil should still be added to the scratch grain which is fed in three feedings a day at the rate of 8 to 9 pounds per 100 birds per day. If the birds appear to be thin, the grain mixture should be increased and similarly reduced if they are overweight. As in the molting period, no milk is fed or artificial lights used. Hard granite grit and limestone or shell are provided in hoppers.

Beginning with the ninth week from the start of the molt, it is uually advisable to confine the birds to the laying house as is the custom with pullets. All-night lights or a 13-hour working day may be used. The birds need a good quality laying mash before them at all times, allowing 24 feet of hopper space per 100 birds. Grain is fed at the rate of 7 to 9 pounds per 100 birds per day, depending upon appetite and weight.

It is also important that sufficient drinking space be allowed so that they do not crowd at the fountain. Usually 5 feet of drinking space per 100 birds will be sufficient. Grit and limestone, oyster or clam shell are kept in hoppers at all times. Sufficient nests need to be provided, usually in the neighborhood of 25 for each 100 birds.

As the birds drop out of production, they should be culled out and sent to market. Rigid culling is desirable throughout the entire fall and winter laying period.

Many poultrymen have been successful the first time they have tried the force molt program. Others after their first attempt have been quick to see where they have made a few mistakes. When they try it the second time, they are highly successful. Force molting yearling White Leghorns properly done will really return dividends to a commercial poultryman.

The "Pros" and "Cons" of Bird'sfoot Trefoil

Condensed from American Agriculturist

BIRD'SFOOT trefoil is a legume which has certain definite advantages; also some disadvantages. Evidence is growing that it can be a very valuable addition to hay and pasture lands in some areas in the Northeast, particularly where alfalfa cannot be grown.

One of its disadvantages is the difficulty of seed production. The seed does not mature at one time; in fact, you can find blossoms, partly matured seed, and ripe seed on the same plant at the same time. As a result, the seed supply has been somewhat limited and rather costly.

Other disadvantages which need consideration are that it is somewhat difficult to establish; produces very little the first year, and starts growth rather late in the spring. The advantages of this plant are that it will grow on poor soil; that it is drought resistant, high in protein, palatable, and yields well.

Bird'sfoot trefoil should be seeded as early as convenient in the spring using 5 to 6 pounds of seed to the acre. Sometimes it is seeded with timothy in which case 4 to 5 pounds of trefoil and 4 to 6 pounds of timothy are used. Ordinarily, it is best not to use another legume in the seeding.

It can be sown without a nurse crop, in which case it will need to be clipped 2 or 3 times during the summer to control weeds, or it can be seeded with a light sowing of oats, not over a bushel to the acre.

A firm seed bed is required, which calls for rolling or cultipacking and the seed should not be more than a half inch deep. Where a grain drill is used, this calls for dropping the seed back of the disks or hoes rather than in front.

Inoculation is important, but be sure that you get the right inoculant and that it is fresh. Mixing the inoculant with an equal amount of cornstarch before it is put on the seed is sometimes recommended.

While bird'sfoot will grow on poor land, that doesn't mean that no fertilizer is required. Use 500 pounds of superphosphate at seeding time or, if the land is especially infertile, 500 pounds of a 4–16–4 fertilizer. Once the trefoil is estab-

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Poughkeepsie, N. Y., May 15, 1948

lished, superphosphate can be applied at 3 or 4-year intervals.

Bird'sfoot trefoil will grow on soil which has too little lime to grow alfalfa, but an application of lime is recommended when seedings are made. In most cases that will mean a ton or two of ground limestone per acre, but the surest way to decide on the amount is to have a soil test made.

As yet it is impossible to guarantee that a stand will be secured on every field where it is tried, but the advantages seem to warrant a trial. At best, you are likely to be disappointed the first year. Plants will be small and you may think that the seeding is a failure, but if you leave it you are likely to be surprised at the growth in succeeding years.

Bird'sfoot can be used either for pasture or hay. It does not make good early pasture, but to some extent this is an advantage because on most farms blue grass furnishes luxuriant pasture early in the spring and the bird'sfoot comes on to furnish grazing later in the summer when other pastures are short. One big advantage as a hay crop is that it does not deteriorate as rapidly as other grasses and legumes, and if conditions make it impossible to cut early you can still get excellent hay in July. Ordinarily, it is cut only once a year but yields two or more tons of fine-stemmed, leafy hay. Once established, stands last for years. It is probable that individual plants do not live for more than 5 or 6 years, but as seed is constantly produced it reseeds itself.

Bird'sfoot trefoil was first discovered in eastern New York some years ago. At first it was thought of as a weed until farmers discovered that cows liked it and that in dry weather it was about the only crop that furnished feed.

Once you get to know it, it is very easy to recognize. It grows 12 to 36 inches high from a branching crown somewhat like alfalfa. When it becomes fully established, one plant can cover an amazing area. However, the characteristic most easily recognized is the blossom, which is yellow and individually resembles a very small pea blossom. When seed pods are formed there are 5 small brown pods on each blossom which resemble a bird's foot and which give the plant its name.

The seed has been rather scarce in some years but there is a fairly good supply available this year.

Organic Matter and Our Food Supply

Condensed from Better Crops with Plant Food

George D. Scarseth
American Farm Research Association, Lafayette, Indiana

AGRONOMISTS and soil scientists know that the basic cause of our food shortage is the low and declining content of organic matter in our soils.

A well-fed people eat lots of protein foods—meat, milk, eggs, and cheese. Protein foods largely disappear from the diet of poorly fed people, and they must manage on cereals—largely energy foods that contain chiefly carbon, hydrogen, and oxygen and very small quantities of tissue- and bone-building substances. We read how millions of people are on diets too low in calories (2,000 calories or less) to supply them with adequate energy for living. Little wonder they aren't productive workers. The energy foods are only human gasoline, and the malnutrition of such people must be terrific even if direct death does not result.

Protein foods are nitrogen-carrying foods. Every farmer knows that nitrogen and soil organic matter are closely related. Every farmer knows that a soil high in organic matter is also a very productive soil. Every farmer knows that legumes like clover, alfalfa, and sweet clover add valuable organic matter to the soil. The farmers also know that the organic matter from these legumes is better than the organic matter from non-legumes, because clover makes nitrogen into chemical compounds out of the free nitrogen in the air.

Any close observer traveling through the Corn Belt this last season frequently observed the paradox where on one side of the road the corn crop was almost a failure because of early wet weather and late summer drouth, while on the opposite side of the road there would be a corn field that was producing abundantly and apparently not adversely affected by the so-called bad season.

This is not a new story because keen observers through the years have seen it. In about 1750 Jared Eliot, a country minister, doctor, and farmer from Killingsworth, Connecticut, said in a letter: "I have observed when I was in y back parts of y Country about 20

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years past when y woods was not pastured & full of high weeds & y ground light, then y rain sunk much more into y earth and did not wash & tear up y surface (as now)."

Our current modern literature contains great volumes of facts showing what happens to the organic content of soils through our farming operations. Here are some interesting facts from Dr. H. Jenny from the University of Missouri. He points out that in general the organic matter content in soils would decline about 25 percent in the first 20 years of farming. The organic matter content would decline on the average about 40 percent in the first 70 years or about 50 percent in the first 100 years of farming. This is where we are today on most of our farms. Where there was little to start with, things are in a tough shape. In the richest areas the shoe pinched badly last year.

Since cultivation increases the rate at which organic matter will burn up in the soil, it is interesting to know that for every ton of organic matter turned into the soil about one-half of its weight on a dry basis, will rot out in two to three weeks, and three-fourths of it will rot in six weeks during the growing season. Since organic matter rots out so fast we need to carefully handle our crop rotations so as to have this rotting occur at seasons of greatest advantage to a new, growing crop, which in itself will grow new organic matter.

Dr. Firman Bear of the New Jersey Station gives data showing that the organic matter content in the fence row of a field was 3.45 percent. The cultivated field adjacent had about one-half this quantity. Just this small difference in organic matter content made the moisture-holding capacity of the soil in the fence row higher than that in the field by about 4.5 percent. If one should convert this into equal inches of rainfall, it amounts to about .7 acre inches of water. This is not a minor matter when summer drouths come.

Professors C. E. Millar and L. M. Turk of Michigan State College point out clearly how the organic matter in soils is related to the supply of important plant-food nutrients: "The humus level in mineral soils is very closely associated with the supply of the nutrient elements, such as calcium, phosphorus, potassium, and nitrogen. Since plant residues are the source of nearly all the soil humus, the quality of plant growth and hence the rate of humus formation will depend to a large extent upon the supply of available plant food in the soil."

Dr. Bear says the same thing from another angle: "Of particular significance is the discovery

that fertilizers, even though they may contain no organic matter, are one of the most fruitful means of adding organic matter to the soils, by reason of the more abundant residues and roots of crops that have been liberally treated with them."

Experiments show that it takes chemical plant foods to make organic matter. Moreover, with lots of humus in the soil the added fertilizers work best. There are many data to show that the loss of rainwater by running off the ground is extremely high, and especially on soils that are compacted and deficient in organic matter. Of course, we all know the value of having the soil covered with some kind of crop. The spring rains are sometimes of great intensity for a few minutes, as high as at the rate of 10 or more inches per hour. During this great intensity as much as 80 percent of the water that falls on the ground may run off. Not only is there, therefore, a great loss of water that the soil would need later in the summer, but the water running off the ground does untold damage in erosion and in carrying away plant nutrients.

We can summarize in a "nutshell" some of the main points in the following manner: When soils are low in organic matter their porosity is poor, and much of the rain that should go into the ground runs away. When soils are low in organic matter they do not have a large capacity for holding available moisture, so that when mild dry spells come the crops will suffer for lack of water. When soils are low in organic matter they are very deficient in available nitrogen, and crops usually starve for this nutrient with the consequence that they will be low in protein content. When soils are low in organic matter they become hard and compacted, so that roots have a difficult time in growing through the soil to pick up plant nutrients. Furthermore, the air space will be so slight that the roots easily starve for the lack of oxygen. When roots starve for oxygen they die and the crop is correspondingly injured. When soils are low in organic matter the crop yields are seriously reduced and the yields obtained are very inefficient. When soils are low in organic matter the response of crops to added fertilizer is not as good as when the soils are high in organic matter, because it takes a good root system to use applied fertilizers to best advantage.

When soils are low in organic matter farming becomes inefficient.

Farm Birds are Good Neighbors

Condensed from Successful Farming

Dr. D. W. Douglass
Biologist, Michigan Department of Conservation

We've all known since our First Reader days that most birds are of help to the farmer. They destroy insect pests, devour large quantities of weed seeds, and make life tough for mice, rats, and other rodents.

But it's easy to see that weeds and pests are ahead of the birds, so let's find out what farming country means to birds, and see what value we can put on having them around. Perhaps we need more of certain kinds of birds.

Among other bird needs supplied by your land, most important of all is food. A large part of a bird's waking life is spent in finding food. Most birds are specialized for eating a rather limited type of food. A bird's menu is limited compared with that of man. It's limited both by what the bird considers suitable to eat, and by what it *can* eat. If you want to know (in a general way) what a bird eats, look at its bill. Feet, too, may be adapted to some particular method of feeding. The scratching toes of chickens and pheasants, the grasping talons of birds of prey are examples. So are the tiny feet of chimney swifts which are so weak as to be of no use whatever in feeding. Of course, this condition is entirely satisfactory in a species that feeds entirely on the wing.

While the chimney swift lives in cities as well as in the country, the long-tailed barn swallow is truly a bird of the farm. It nests by choice in barns and sheds that are not too tightly closed to allow easy passage in and out. Barn swallows like a nest near a pond or other water, because water favors their insect food. They, too, feed on the wing. Occasionally, however, they will alight on the ground to pick up insects. Mud for the outer walls of their nests comes from the edge of pond or stream, or perhaps from alongside an overflowing water trough.

Another bird that takes all its food on the wing is the nighthawk. This bird cruises jerkily across the sky in search of prey, and sometimes nose-dives in a headlong sweep toward earth, "pulling out" just before you expect a crash. At the bottom of the dive the nighthawk's wings give

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out a humming note as the air screams thru the quills. This sound is considerably more musical than the bird's nasal call note.

In contrast to the swifts and swallows that make a proper nest, the nighthawk merely lays its two eggs on the ground. It often chooses gravelly places where the pebbles match the eggs and hides them.

One way you can recognize the nighthawk is by its habit of perching lengthwise on a limb or telephone cable. As a destroyer of insects, the nighthawk is highly regarded. As many as 500 mosquitoes have been found in the stomach of a single nighthawk. Potato beetles and boll weevils likewise are fair game. The nighthawk, by the way, is not a hawk at all. Its beak is very small and attached to a very large mouth bordered with bristles, making it really a flying bug trap.

By comparison with these ace pilots the flycatchers may seem a trifle lazy. Nevertheless they take their food almost entirely from the air, and that food consists of insects that bother you and your crops. Instead of cruising about in search of flying bugs, catchers perch on a twig and wait for an insect to fly past. Then comes a short dash, the insect is snapped up, the bird returns to its perch.

The kingbird is one of the best known of the flycatcher family, and the one most likely to nest in the farmyard. By the way, a kingbird tolerates no nonsense from larger birds, and seems to enjoy chasing crows and hawks.

The pewee of the sad, sighing call, is another flycatcher, and is found in many woodlots as well as in wild land forests of the United States.

In contrast to the birds that feed on flying insects are those that forage mostly on the ground. Few are better known than the meadow larks. There are two distinct kinds of meadow lark—the Eastern and Western. They look much alike but sing very differently. In several of the Midwestern states, particularly Iowa and Minnesota, both kinds of meadow lark occur.

The call of the Eastern meadow lark is loud, clear, and joyous, whistled in pure tones as: *hee're, wayup hee're.* The call of the Western meadow lark is a rich *chuck, chuck,* followed by a wooden rolling *br-r-r-r-r* quite different in tone but not in form from the Eastern meadow lark's harsher, harder call. The two kinds of meadow larks seem to recognize their differences and seldom if ever interbreed.

Tho meadow larks make a roofed-over grass nest on the ground and get their food on the ground, they seek a fence post or telephone pole for singing. There they cut

handsome figures by virtue of their bright, yellow breasts and black collars. The summer food of the meadow lark is almost entirely insects, of which grasshoppers, cutworms, and caterpillars are a large part. In fall and winter, their food is chiefly weed seeds. So they do double duty for the farmer.

The meadow lark's close relatives are blackbirds and orioles, but the much smaller horned lark is kin to the skylark of Europe. Horned larks are abundant and widespread over the United States. They are among the earliest of nesters, often starting in March. Late snows may interfere with the hatching of the first brood. But in many instances the incubating bird manages to keep the nest from being buried, and brings her eggs safely thru. Horned larks are birds of open fields and roadsides. Since they feed chiefly on insects, weed seeds, and waste grain, they are useful birds.

No account of ground-feeding birds would be complete that failed to include the game birds. Over the Eastern United States, the bobwhite probably is the best known of the group, tho in the extreme North he finds the winters too hard. Compared with pheasant and grouse cocks, he is a model father and husband. It is even reported that if an acident overtakes his mate, he will carry on incubation duties. It is an odd fact that his familiar whistle usually indicates an unmated bird. Happily paired, he stops singing.

In the nothern tier of states, above the zone preferred by bobwhite, the colorful, ring-necked pheasant has become established as the chief game bird of the farmlands. Its ancestors came mostly from China. Just why pheasants have succeeded in only a rather narrow belt from portions of New England, New York, and Pennsylvania to Nebraska and the Dakotas (and certain irrigated Western lands), is not well understood. Apparently pheasants require good soil to flourish best. The mere presence of plenty of corn and other farm crops is not enough to guarantee that pheasants will do well.

Pheasants are almost entirely farm birds, and do not get along very far from cultivation. As destroyers of insects, especially grasshoppers, they do useful work. But it cannot be denied that their record is marred by their fondness for corn and sometimes for other crops. Their chief value, therefore, aside from the undeniable beauty of the cock birds, is as game. In the opinion of the landowners I know, the pheasant pays its way.

Sparrows and finches are the largest family of birds, in point of numbers of different kinds. The

whole tribe is provided with stout beaks for eating seeds, and many are distinctly birds of the farm. For example, it is doubtful that any farm in the Midwest would fail to have several pairs of vesper sparrows.

Vesper sparrows nest on the ground in grassy depressions, or in low clumps of vegetation. Dry, upland fields and roadsides are their chosen habitat. Their song, soft and sweet, is at its best when heard in the quiet hour after supper, hence the name "vesper" sparrow. Like almost all of the sparrows, their food consists of insects in season, and weed seeds or fallen grain thruout the year.

The whole sparrow family includes a number of species associated more or less directly with farming country, which deserve to be better known and respected. Unfortunately, the guttersnipe English "sparrow" (which is a weaver finch and not a true sparrow) has given the family a bad name. Among the other native sparrows of the farmlands, one ought to know the field, savannah, chipping, song, and grasshopper sparrows.

While sparrows are rather dull-colored birds, other members of the family may be decidedly colorful. What is gayer, for instance, than a troupe of bright yellow goldfinches, with their contrasting black caps and wings?

As colorful as the goldfinch is the brilliantly blue indigo bunting, yet another member of the sparrow-finch clan. Look for them where a bit of shrubby woodland borders a brushy field. The males are tireless singers, and the loud warbling song is not unpleasant, tho it falls short of equaling the vocal efforts of song and vesper sparrows. Compared with her mate, the female bunting is a drab little sparrow that would be hard to recognize by herself. Indigo buntings have the usual family liking for both seeds and insects.

All of the birds so far discussed have been insect eaters, at least in part, but the mourning dove is practically 100-percent vegetarian. This is perhaps fitting in a bird that symbolizes gentleness and peace. The mourning dove is also well known as one of the least successful of builders. Its nest is the rudest platform of sticks, and one wonders how any young survive. Two eggs is the rule, and the young are fed on "pigeon milk," a whitish fluid coming from the parent's crop. The doves make up for having so few young at a time by rearing several broods in a summer.

The birds of prey—hawks and owls—are frequently called aerial bandits, and regarded as public enemies. It would be more accurate to call them "flying policemen" and "sanitary technicians."

By and large hawks and owls are useful birds to have around because rats, mice, ground squirrels, and other rodents make up their principal food.

A garden patrolled at night by a barred owl and thru the day by a watchful, red shouldered hawk or redtail is not likely to suffer from rabbit or woodchuck raids —at least not for long. A barn inhabited by barn owls is well insured against mice.

To be sure, there are two or three species of long-tailed, short-winged hawks (note that "long tail" and "short wing") that are usually considered bad actors because their chief prey is birds, including game birds and poultry if available. But even these "blue darters" take *some* rats and mice as well as birds.

A good hawk rule to follow is that a broad-winged, short-tailed soaring hawk is a friend until caught in the act of raiding the chicken yard. Such a raid is unusual. Too often these slow-flying hawks are shot and nailed to the barn door for misdeeds done by some of the blue darters (goshawk, Cooper's hawk, or sharp-shinned hawk).

Great horned owls sometimes prove troublesome to poultry, but since they prowl by night, properly housed hens are safe from their powerful talons.

The real villian of the bird world, according to many nature-writers, is our own American cowbird. The cowbird certainly upsets our ideas of what a good, honest, hard-working bird should be. He has completely done away with any homemaking. Cowbirds build no nests, but lay their eggs in the nests of other birds. If the victim is a smaller species, it frequently happens that the rapidly growing cowbird lives at the expense of the rightful owners of the nest.

On the basis of what it eats—numerous insects and quantities of weed seeds—the cowbird is useful to the farmer. From the looks standpoint the male cowbird is not unpleasing, with its brown head and glossy black wings and body. It has a wild, whistling flight-call, and a gurgling courtship song. In fact, the cowbird is a good example of the difficulty of reaching any definite conclusion about the dollars-and-cents value of any wild bird.

If they weren't so unhelpful to other birds, cowbirds could be credited with doing a good job of insect and weed control.

So let's first get acquainted with all the birds on our farms, and then decide for ourselves what part birds play in helping us to raise our crops and, in addition, to get fun out of living.

Home Freezing on the Farm

Condensed from The Rural New-Yorker

Glendel C. Nichols

ALTHOUGH freezing is known as the easiest and best method of food preservation, there are certain rules and guides which should be followed.

Selection of proper foods of all kinds is the first and one of the most important factors in food freezing. Not only is the selection of fruits and vegetables very important, but proper selection is necessary for meats also. Only well fitted and finished meats should be chosen. The meat from high grade animals, properly fattened, gives best results in your freezer; otherwise, meat products will lack flavor and tenderness; they also will have a tendency to dry out. Obviously, only healthy animals should be killed, and care must be taken when they are slaughtered.

Poor quality in a home frozen meat product has often been traced back to inexperienced slaughtering. Unless one has the proper facilities and knows how to handle the needed implements, it would be wise to let a slaughtering service do the job; or to arrange for it with an experienced neighbor. Slaughtering fees as a rule are very small in rural areas; sometimes just the animal hide is all that is required as payment. Moreover, with the growth of the community locker plant, slaughtering services have become more numerous; in many sections the butcher will come right to the door, pick up the animal and return it, ready to be cut up, or deliver it to the local locker plant. When time, money and effort are expended in raising and fattening an animal to the desired stage for freezing and eating, it does not pay to lose any of the goodness of the meat. Proper slaughtering means the difference between just a steak and an excellent one in the freezing unit.

With vegetables and fruits, selection again plays an important part in the home freezer program; even varieties in these two classes need consideration. For example, certain peas that are desirable for table and canning purposes, both at home and commercially, may not be best for freezing. Thomas Laxton peas are recommended for an excellent frozen product; for asparagus, the Martha or Mary Washington; likewise the Fordhook lima beans. In the fruit category, Julymorn

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strawberries, Cuthbert raspberries and Hale Haven peaches have proved among the best for freezing. As to what grows best in your own locality, when freezing is the goal, a list of the most desirable varieties of fruits and vegetables may be readily obtained through the various State University extension services.

All foods which are to be frozen should be packaged in moisture and vapor proof containers of one kind or another. Some people prefer the box and cellophane bag combination which can be used from year to year by replacing only the cellophane bag. Others prefer rectangular cardboard containers, tin containers or the new glass freezer jars.

Why must the packaging material be moisture and vapor proof? Because the air in your home freezer, or in your locker, is very dry cold air. When a food is put into a freezer, that food contains moisture which will be drawn out into the dry air if the product is not properly protected by being in a moisture and vapor proof container or wrapping paper.

Whereas fruits and vegetables are usually packed in box, bag, tin or jar, meats require wrapping, an art quickly learned. Again special moisture and vapor proof paper is a must. The secret to proper meat packaging is to draw the paper as close to the meat as possible; the paper should form a second skin to the meat and so press out the air in the package with the meat. The so-called drug store wrap is preferable to the old style butcher wrap for two reasons: (1) by pulling the paper up very tight, putting the two inside edges together, and folding them down in about one-half inch folds until the paper is snug around the meat, we get a complete seal in the paper itself and exclude any air because the sides are folded in and up over the meat; and (2) less paper is used in wrapping with this kind of wrap than with the butcher wrap. Studies show that the best paper costs only 25 cents more as wrapping for 100 pounds of meat than paper of inferior grade. One good roast wrapped properly will more than make up for the extra 25 cents.

After fruits, vegetables and meats have been carefully selected, the next step paves the way for actual preparation. The preparation of frozen foods is very simple and easy as compared to canning, drying, or any other method of food preservation. Where fruits and vegetables are concerned, the sooner they are prepared after being picked in the garden, the better the frozen product will be. Fruits and vegetables should be harvested at their optimum of ripeness, just as you would want them for the table. Garden-fresh foods, picked

one day, put in the cellar and held over a day or two, do not give the best results; nor is the delay necessary since freezing is such a ready process. In any case, the proper degree of ripeness and the quick preparation for the freezer cannot be emphasized too much.

In an actual experiment, for example, peas of good quality were picked at random from the same vines. Part of them was prepared and frozen the day they were picked; another part was set in a cool cellar, in the shells, and held over for one day. This pre-freezing procedure for each part was then recorded on the boxes in which the two groups of peas were packed, and the boxes left frozen in a locker plant for six months. At the end of that time, a box of each kind was opened at the same time and cooked in exactly the same way. Although the color of the peas was identical for both sets before and after cooking, there was a definite difference in their flavor and texture. The peas that were held over one day had lost the tender, fresh quality which they had had when picked and their texture was very mealy. The peas which were processed immediately after picking were equal to garden-fresh ones and a delight to the most critical. This experiment may serve as a guide for foods in general, preparatory to actual steps in the freezing process.

If a properly chosen and slaughtered animal is to be frozen and the necessary wrappings for storage in the freezer are at hand, cutting the meat into suitable pieces for this process is the next preparatory step. Those who are inexperienced, or who do not have the proper saws, cleavers and knives, will do well to have the carcass cut up in the local butcher shop. (Community locker plants usually have a like service for meats to be stored there.) Proper cutting is important because it separates the tender cuts from the less tender parts, giving a more satisfactory product in the final analysis. In determining the size cuts you wish to freeze, it is well to keep in mind the size of the family and freeze accordingly, with the proper allowance for guests, of course. Standard serving requirements for meat are one-fourth pound per person without the bone; one-half pound per person with the bone. Boning saves freezer space by as much as one-fourth, in many instances.

Meats when prepared and packaged as outlined above can be stored at a constant temperature of zero degrees Fahrenheit for many months. Pork and lamb should be used in from six to eight months depending on the fatness of the meat; the fatter the meat, the shorter time it should

be stored. Beef, veal and poultry can be stored for a year without noticeable change. Smoked meats must be packaged exceptionally tight or the odor will permeate the other food in the freezer. Bacon should be frozen and stored in one pound packages before slicing. Hams and shoulders should be frozen in the cuts in which they will be cooked, such as whole, sliced, halves or quarters. Unless a very strong brine has been used for cured meats, they should not be stored more than a few months.

Poultry for the freezer is prepared just as you would do it for the table; using whole, halves, or cut in pieces. Package it as you would meat, and freeze. Cooked poultry may be frozen, and you may stuff your Thanksgiving turkey and freeze it until the day arrives. Wrap the giblets separately; they may then be placed in the bird cavity, or tucked under a wing. The latter way is more desirable, and more accessible, during the thawing process.

In the freezing of vegetables many ask why blanching is necessary. Blanching, or scalding, retards the action of the chemical agents present in all vegetables; it also makes them easier to pack into cartons. Undesirable changes in flavor, quality and color are prevented by blanching. Time schedules for blanching the various vegetables differ, and timing is dependent upon whether boiling water or steam is used. One's own booklet of directions, that come with the freezer unit, should be followed.

Before heat sealing the cellophane, pliofilm or any other kind of moisture and vapor proof bag, which holds the blanched vegetable and is inserted in the waxed carton, all air must be removed. Skill in this may be developed as fingers press out the air. For heat sealing cellophane, a household iron, a curling iron or a special heat sealer may be used. When sealing pliofilm, unless a specially treated heat sealer is used, it will be necessary to place a piece of paper between the iron and the pliofilm. Pliofilm is a rubber product and if direct heat is applied to it, melting occurs. A table top or any flat surface is helpful if a household iron is used for sealing. A little practice will do the trick.

When it comes to fruits, the process is even simpler. To freeze, prepare fruits as you would for the table; that is, wash, sort and hull strawberries, being careful not to include over-ripe or under-ripe berries. Sprinkle them with sugar (one part sugar to four parts berries), put in a moisture and vapor proof container, and freeze at below zero temperatures. A valuable guide on sugar needs for freezing fruits is this: fruits that will make their own juice in preparation for freezing (sliced strawberries, pineapple, grapefruit, etc.) can be frozen well by adding

sugar dry. Fruits that are better by the addition of ascorbic acid (peaches, pears and apricots), may be frozen with a syrup (three and one-half cups sugar to four cups water on these fruits). On the other hand, certain fruits (cranberries, blueberries, boysenberries, loganberries, raspberries, rhubarb, youngberries and blanched apples) can be frozen with neither sugar nor sugar syrup. Imagine being able to pick red juicy raspberries right from your berry patch directly into your frozen food container, and then freezing them at once for Winter use with no more work involved than needed for the Summer table!

The reason for the addition of ascorbic acid (vitamin C), or an ascorbic acid preparation, with such fruits as peaches and pears is that contact with the air when they are peeled will darken them. If an ascorbic acd preparation is used, follow the directions on the package; for using pure ascorbic acid and variations in the use of this acid, further information may be procured in freeze preparation booklets. When packaging fruits in sugar syrup, allow one-half inch head room in cardboard containers, and one to one and one-half inches in glass jars. For extra protection against oxidation, crumple a piece of cellophane, waxed paper or the like onto the top of the fruit before closing the lid on the container. This keeps the fruit down under the syrup, and helps prevent discoloration of the top pieces.

All packages put into the freezer should be labeled carefully with the date, name of the product and any special instructions for yourself which may prove beneficial when deciding what to package the following year. A china marking pencil is suitable to label almost any kind of package; different colored crayons can be used to differentiate the kinds of meats or other foods if desired.

When cooking frozen vegetables, with a few exceptions, they should not be thawed, but put into the boiling water in a frozen lump. Greens, however, should be thawed to permit even cooking. Asparagus and broccoli should be thawed enough so that the stalks can be separated. Frozen vegetables require about one-half the cooking time of fresh vegetables. Fruits and other foods should be thawed in the container and opened just before serving. This prevents the occurrence of oxidation.

The more one uses the home freezer, the more one will try to experiment with other farm foods such as dairy products, eggs, fish, game, cooked foods, and a tempting variety of baked goods, breadstuffs, pies and pastries. Space, however, is always vital and it is the necessities of the diet, and surplus of farm crops that take first place in the program.

Less Work Makes More Pay for the Poultryman

Condensed from Eastern States Cooperator

G. T. Klein
Extension Poultry Husbandman, University of Massachusetts

Your feed costs on a poultry farm are influenced largely by situations beyond your control. That is also true of taxes, interest and a few other items. But labor costs which rank next to feed in size or percentage of total costs are to a considerable extent under your control. World, national and local situations determine almost wholly the price of feed. But with labor, the man that you hire for $40 a week can brood 20,000 chicks, or care for 5000 laying hens or he can put in his time on a fourth that number.

Whether a worker cares for 20,000 or 5000 broilers or replacement chicks to 12 weeks of age, determines whether it costs four cents a chick for labor costs or 20 cents. In the same way you can hold the labor cost in a laying house to 50 cents a bird for the year if your man cares for 5000 or it can run to $2 if you let him keep busy with 1200 birds.

These figures are not fantastic or wishful thinking. They are real, taken from real poultry farms.

I am interested in efficiency and labor saving on poultry farms because I believe it is the way commercial poultrymen can lower costs and meet the competition of the flood of products that are produced as a sideline on the general farm. It costs money to establish a setup for this type of mass production, but it seems to be a necessary cost.

It is unfortunate that size of unit is so important in labor saving. Often it is not practical to put aside existing buildings and construct new ones. Sometimes, though, it is practical to remove partitions, converting small rooms into larger ones. Often it is practical to add to buildings now in use, making them larger and better suited to mass production.

No one knows today just what the ideal size for a brooding or laying pen is, but it is certain that it is quite large. We have a number of laying houses in Massachusetts with pens 40 feet deep and 40 feet long, some even larger. These work well and I doubt that there is much to be gained by

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making them larger. In the 40-foot pens, it is easy enough to house 550 birds which greatly concentrates the work. It might save time in door opening to have pens 80, 120, 200 feet long or even larger. It would at the same time offer some handicaps. Culling or handling of the birds is more complicated in the larger pens. The larger pens are a handicap at housing time unless all birds are the same in age and development. Then, too there is the occasional hurricane or disturbance which might cause piling up in one end of the building with the loss of hundreds of birds. I point to these dangers though I've seen pens which housed 3500 birds and worked satisfactorily.

There is another advantage of building pens large. The cost of construction on a bird basis is less than in smaller units and that goes for the insulating costs, too.

It is impossible to say just how many square feet of floor area are necessary for a layer in these larger pens. Five-hundred-fifty is a good number for 40 by 40 pens. I've seen 650 or 700 in the same pens. When you go beyond 550 you increase the problem of wet litter. Yet some crowding for a part of the year might make you more money.

If you are willing to wash eggs, you can cut the floor space to around two and one-half square feet or less and continue to get good performance. You may want to trim beaks or put some kind of anti-picking gadgets on the flock. But flocks are not as hard to control in this respect today. Why, I'm not sure.

Bossing isn't as much of a problem in large pens as in small one. A timid bird has room to move around and get out of the way of the bosses. Soon the bird has a place at a hopper in another part of the room.

I've never been able to see that dampness in pens or some ammonia smell has anything to do with flock health or low production. If you are willing to put up with wet pens in the coldest of weather, you can go considerably further in cutting floor space per layer than we've been accustomed to. Some say you can go to two square feet.

When we study egg price charts and note how prices for the last half of the year (June to December) average 12 cents to 16 cents more per dozen than prices for the other six months, we wonder why we don't do more about it. December or January hatches could be "crowded" in pens at the two square foot rate until some birds start molting in the fall. Then culling would make more room for the winter.

Don't get me wrong on the wet

litter. I'm anxious to have dry pens if they are not too expensive. It's so much nicer to work in them and they save a tremendous amount of time in egg cleaning. In large pens and insulated houses it seems fairly easy to have dry litter if the housing rate is held to a bird for three square feet and provided the birds are on a grain and mash feeding system.

The litter management will have to be something like this. House the flock as early as possible in the late summer or early fall and have four or six inches of litter on the floor. As it settles add more and stir it frequently adding some hydrated lime, possibly as often as once in 10 or 14 days. Plan to add enough lime so that you will have about a pound to the bird by mid-winter. Slightly more won't hurt. Add more litter from time to time if the pen needs it. The birds will help with the litter moving if you feed grain or pellets on the floor.

It's old litter that stands up best in cold weather. That has made many a poultryman take a chance on leaving the litter in the house for more than one year. It works out okay without being a disease hazard except where pullorum, cholera, typhoid or some other bacterial infection is present. I believe it's best to take out some of the old litter each summer and add possibly a third new.

It's a mistake to have more than one waterer in a laying pen. For 550 hens, a waterer four feet long is large enough and it cuts to one, the number of wet spots in the pen. You've got to do some changing of litter around the fountains because the birds will flick water and this can't be avoided. Whatever the system, however, be sure the birds are getting adequate water.

You can't cut labor costs without having a convenient feed storage room accessible from the feed truck with unloading platforms, feed hoists or elevators. It's handier to have a feed room on each floor although you can move it with elevators or chutes. A carrier for eggs, feed and poultry is just as important in labor saving as the large units or the dry litter.

Long houses, at least 24 feet deep and possibly 30 feet is better, offer the best way to save brooding labor. The house needs some kind of hot water brooding system for both fuel and labor saving. For economy in installation, use a pipe system with pipes about eight or nine inches from the floor and with a hover over them. I believe it's best to have the pipes at least six feet from the rear wall.

For a breeder who has several ages of chicks, I believe it's better to use a radiator system. Here you

have a chance to vary the temperature from one pen to another with a valve on the radiator. The radiator is about eight or nine inches from the floor and has a home-made hover over it. The radiator is about six or eight feet from the wall. This is a slightly more expensive system to install than the pipes, but it has the added advantage that the radiators can be taken up easily and the building used for layers with a minimum of work.

The World Farms for Food

Condensed from Extension Service Review

Duncan Wall
Office of Foreign Agricultural Relations

FIFTY-FOUR nations now are members of the Food and Agriculture Organization first to be formed of the United Nations specialized agencies.

Recent developments have given FAO an executive body of 18 member governments, the Council of the FAO to guide its policies between annual conferences, and have established (to use a familiar analogy) an annual world "outlook and goals meeting."

Since its establishment at Quebec in 1945, as a result of the 1943 Hot Springs United Nations Conference on Food and Agriculture, FAO also has set up a program of work through its technical divisions to aid in the development of agriculture, fisheries, nutrition, forestry, and economics, especially marketing, and statistics.

FAO was conceived originally as a longer-range international effort to improve food supplies and the welfare of rural people. Although continued world food scarcity has emphasized the importance of this, the spring of 1946 brought a food crisis so immediate and acute that FAO convened a special meeting on urgent food problems. Production had not yet recovered from the war. Crops had failed in densely populated food-deficit areas. More people were malnourished, even facing starvation, than ever before.

The special meeting resulted in formation of the International Emergency Food Council of 34

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nations, whose job was to recommend agreed-upon distribution (allocations) of scarce foods and fertilizers. This continued the wartime work of the Combined Food Board.

Looking ahead to the time when surpluses, as well as shortages, might again plague the world, the meeting also requested the Director General of FAO to work out longer-term plans.

The Director General's Proposals for a World Food Board were accordingly laid before the 1946 Copenhagen FAO Conference. There the objectives of the proposals were accepted—to organize and improve agricultural production and distribution so as to raise diets to a health standard for all people, and to stabilize prices at fair levels.

A Preparatory Commission of experts from 17 countries was appointed to work out detailed plans for any international machinery that might be needed to reach these objectives. After 3 months of work in Washington, the Commission made its report, which became the principal business of the 1947 FAO Conference at Geneva. Accepted in substance by that conference, the report thus becomes important as a statement of FAO's objectives and program.

The Commission agreed that people will not be well fed, nor will farmers enjoy good prices, unless the whole economy of the world is healthy and active—producing, working, trading, and consuming. Nations should, therefore, work toward this end, with cooperation among the international organizations such as FAO itself, the International Bank for Reconstruction and Development, the International Monetary Fund, and the proposed International Trade Organization.

In such cooperative international efforts, FAO would have the important task of assisting agricultural development, for there will not be enough to eat where the soil is stirred with a wooden plow, crops harvested with sickles and threshed with flails; where seed and animal stocks are poor and pests uncontrolled; where soil fertility is neglected.

Another great difficulty, the commission held, is that governments everywhere have been adopting national programs for agriculture without considering the effect of these upon other nations. For instance, one country might be paying bonuses for uneconomic grain production, while another was trying to help its surplus-burdened grain growers.

If national programs could be integrated internationally, progress might be more rapid toward the FAO objectives of better diets for all and more stable prices for farmers. The Commission, there-

fore, recommended that the top national policy officials in food and agriculture should annually talk over the world situation and their various national programs. The first such consultation took place at the Geneva Conference.

Particularly where production is specialized, however, farm commodities might at times still pile up into burdensome surpluses with widespread unemployment. The Commission recommended that when this happens, or is expected, international arrangements among exporters or importers be tried, rather than strictly national action. For each such case, an international commodity agreement might be negotiated, after study of the problem, in accordance with provisions of the ITO Charter, then in draft form.

The agreement might cover sharing of the export market by means of quotas, an agreed-upon range of prices, and so on. Measures to increase consumption would be especially important. For example, it might be agreed that exporting countries could sell extra-quota surpluses abroad at special low prices if the food product were used for nonprofit nutritional programs like the United States school lunch or food stamp plans, among chronically underfed people until general economic development could remove the basic causes of malnutrition.

Because of FAO's great interest in commodity problems and possible international agreements dealing with them, the Commission concluded, some year-round policy body was needed, and the Council of FAO was, therefore, recommended. In accepting the substance of the Commission's report, the Geneva Conference amended FAO's constitution to provide for the Council.

In view of the continuing emergency need for allocations, the Conference also recommended that the work and staff of IEFC be continued by merger with the Council. A number of recommendations as to the technical work of FAO also were adopted, and plans were authorized for extending FAO's work through four regional offices.

When the Council held its first session, November 4 to 11, in Washington, it took steps to carry out the conference recommendations. The IEFC met concurrently, and arrangements were completed for the merger of the food allocations work.

The Council also set up a Policy Committee on Production and Distribution to study and prepare for the council recommendations on longer-term measures to improve and develop agriculture.

This is the machinery, and these have been the steps of international organization for better diets for all people and better living for farmers. But machinery is

only the expression of purpose behind it. The purpose is health, order, decency, freedom, and peace in the world. Well-fed people may still reject these, but in a hungry world there is no peace.

A Rotation Worth a Fortune

Condensed from the Nebraska Farmer

Jim Boan

THE world will beat a path to the door of the man who builds a better mouse trap, according to the old saying. Albert Kuhl, of Randolph, didn't build a better mouse trap, but he built better farms with a rotation of sweet clover, corn, oats and bees. Bees—to pollinate the sweet clover he grew. This practice paid off, too.

Back in 1936 you will remember sledding was a little rough on the farm, especially if you didn't have one. Albert Kuhl had no farm. But he rented a farm and got a few colonies of bees. Cash was the big problem for farmers then. Most of them were growing corn, because it was a cash crop. It is no wonder that Mr. Kuhl's neighbors watched him with a critical eye when he put out his bees and planted sweet clover instead of the usual corn crop.

It was drouthy in the 30's, and the first sweet clover seed crop wasn't exceptional. However, the bees had done a good job. Mr. Kuhl had an income from the sweet clover seed and from the honey. His cash income was higher than the average income from corn. Then neighbors began to watch and talk. Nitrogen from the sweet clover was doing things for the corn.

As the corn, oats, sweet clover (and bees) rotated around the farm with the years, cash rolled into Mr. Kuhl's pockets. He bought the farm. Then another farm. Now he has eight farms. He doesn't farm any of them himself now; he doesn't have to. But he supervises his tenants just far enough for them to see the results of his money-making rotation.

Mr. Kuhl figures his bees have produced two million pounds of honey in the past seven years. Al-

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together he probably has produced about three million pounds. That's the reason Mr. Kuhl sold out of the honey business last year. It was too big for him to take care of it—and his farms, and his sweet clover seed.

He sold his bees to the Miller Honey Company of Colton, California. This company is a part of the Sioux Honey Association, largest honey packers in the world. They have offices in Sioux City, Iowa; Colton, California; and Lima, Ohio. The bees they got from Mr. Kuhl are in four Nebraska counties and number about 2,800 colonies of the 350,000 owned by the Miller Honey Company.

Although Mr. Kuhl sold his bees they will not be moved from his farms. He plans to continue his rotation practices and produce certified sweet clover seed. He estimates his share of the honey which is made from the sweet clover on his farms to be about what is produced by a hundred colonies of bees.

All totaled Mr. Kuhl owns 1,280 acres now, with 320 acres in the home farm five miles west of Ranolph. Each year 40 of each 160 acres is planted to sweet clover. This year 148,800 pounds of sweet clover seed were grown and of this 55,200 pounds were certified Madrid sweet clover.

Last year the sweet clover yield was about eight bushels an acre, despite the dry weather. Mr. Kuhl estimates his corn yield to be from 40 to 80 bushels an acre, averaging about 50 bushels. This is corn grown on sweet clover ground.

Controlling Cattle Grubs

Condensed from the Kansas Farmer

E. G. Kelley
Kansas State College

THE annual tonnage of beef trimmed from carcasses and condemned by federal meat inspectors because of cattle grub injury is a heavy loss. Trimming an average of 2 pounds of meat from the loin and ribs of grubby carcasses amounts to a waste of more than 12,000,000 pounds every year.

One important insect problem of the owners of beef and dairy cattle is cattle grubs. These grubs cause losses to hide and flesh, and to milk production. The flies, by chasing the animals, cause severe losses to the lives of cows, and especially to new-born calves.

These losses to cattlemen and dairymen are not necessary. The grubs can be removed from the backs of the animals, preventing the maturing of adult flies.

Heel flies—that produce the grubs—lay most of their eggs on the stiff hairs under the dew claws of the hind feet of cattle. Sometimes they miss the feet, and lay eggs on hairs higher on the leg. Eggs hatch in 4 to 6 days during normal spring weather. The tiny grub bores a hole thru the skin and enters the flesh for feeding.

While many substances have been applied to cattle to repel and prevent the heel flies from laying their eggs, or to kill the eggs deposited on the hairs, they have not proved effective or practical. All experimental work has demonstrated that the best time to attack the pest is when the grubs are located under the skin on the back of the animal and may be reached thru the holes they have made in the skin. Each grub which is permitted to develop and transform to a heel fly may produce a female fly capable of laying 300 or more eggs.

The fly lays the eggs during April and May and this is well indicated by the cattle running from the flies. The cattle throw the tail high into the air and run as fast as they can, trying to get away from the fly. Often the cattle will run into water holes.

The grubs travel from the heel up the leg, down across the stom-

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ach to the esophagus. When they reach that part of the throat known as the weasand, they burrow thru it to the inside layer of mucous membrane. They reach the weasand in late July to early September. It appears that the small grubs feed on the tissue of the weasand and cause considerable inflammation.

The second part of the trip for the grub is from the weasand to the back. In order for them to reach the back they must burrow thru the flesh of the front quarter; in other words, the shoulder meat, and they finally reach the back about the middle of December. When they reach the back they wander around quite a lot to find a suitable place in which to make the hole. Once they get the hole made they put their spiracles (nose) into it and breathe air from the outside. Shortly after making the hole, the grub makes a cyst about itself and that cyst becomes quite large as the grub continues to grow. The grub completes its growth in the cyst along in January or February. When the grub is full grown it turns black and becomes mobile. When it falls from the back of the animal it can and does crawl to safety where it changes to the adult.

The heel flies are plentiful in many pastures during these warm days. Look for cattle running.

There seems to be no good way to use the new insecticides for combating the cattle grubs. DDT, BHC, Chlordane, and Toxaphene are good materials for combating horn flies, but the spraying does not reach the heel fly.

There are 4 good ways to combat cattle grubs:

Squeezing Out the Grubs

Squeezing out cattle grubs in early winter is a good way to combat this pest. This is an especially good way for the dairyman who has only a few head of cows and a few head of calves. Squeeze out the grubs just as soon as they appear in the backs of the cows. At the time they appear in the cows they are also appearing in the calves. Get the calves into the lot and get out the grubs.

During the last 15 years research workers have discovered, and Extension specialists have demonstrated, that finely ground powder of the roots of the derris, timbo, or cube plants, the active ingredient of which is rotenone, properly applied as a wash, dust, or spray to backs of infested animals is effective and no injury to the animals results.

Spraying

Spraying has proved one of the effective ways to treat large herds, or herds of more than 100. Mixtures that give good results were made as follows:

Put 7½ pounds of cube or derris (having a 5 percent rotenone content) into the tank. Pour onto it about 5 gallons of water and stir until the powder is wet. Then add enough water to make 100 gallons. This mixture must be kept well stirred thruout the treatment, or it will settle out.

These mixtures give excellent results when applied correctly. The best way to apply the spray mixtures is to keep the pump at 400 pounds pressure at the gauge and apply with a "drive" spray nozzle, which makes a fine spray. The nozzle should be held about 16 inches from the back of the animal; thus a cone of about 6 to 8 inches will develop.

Cattle were treated during the winter when temperatures were below zero, and apparently there was no harm to the animals. The cattle dried very quickly. Since cattle may need treating during very cold weather, one will need to exercise great care in handling the machinery to keep it from freezing. The pipe and pump will have thin films of water that will freeze quickly and cause the parts to stick. Drain well for overnight or before moving, or put it in a building that is warm.

Dusting

Application of the prepared dusts is made by hand. This method is convenient for the farmer who has only a few head of beef cattle and for the dairymen.

The approved mixture is made of 1 part derris or cube (having a 5 percent rotenone content) mixed with 2 parts tripoli earth or pyrophyllite. This makes a 1.66 percent rotenone powder. These dusts are applied to the back of the infested animal with care so as not to make a fog of the dust, and then it is rubbed into the hair. Rub it vigorously so as to remove the scabs from the bumps made by the cattle grubs. The best applicator is made with a wide-mouth pickle bottle having a screw-top lid. Punch 8 to 10 holes in the lid with a 20-penny nail. A big advantage in using the dusting method is that it may be applied any time during the winter. It may be applied to one grub or a dozen, and applied the very first day the grub makes its hole thru the skin.

Caution

The dust made with tripoli earth or pyrophyllite is for dusting only and MUST NOT be used in water for washing, dipping or spraying.

Washing

The washing method has been one of the good ways to treat for the cattle grub, and incidental-

ly, it gets a lot of lice. The wash must be applied with vigor, and care must be taken to rub the solution into every hole that has been made.

Mix well 12 ounces of cube or derris (having a 5 percent rotenone content) with 12 ounces of wettable sulfur. Add a small amount of water to make the mixture wet, then fill the container to 1 gallon of water. Stir, and it is ready for application. Put just enough on the back of the animal to get the hair and hide wet along the back. Work from the shoulders to the tail bone and down the side to reach the last grub. A scrub brush made of palmetto will stand a lot of use and will not get soft. The common bristle brushes will get soft and be of little use. One may use a metal currycomb, but this must be used with care so the skin will not be torn. One gallon will usually treat 25 to 30 yearlings.

Time to Treat

Treat the young grubs just as soon as they make the hole; the hole can be discovered by gently rubbing the hand over the back of the animal. Treat early and repeat in 20 to 24 days. The third treatment should be 20 to 24 days after the second. For gentle animals, examine them for later appearing grubs and treat each late individual. Get the last one.

Food Poisoning

Condensed from Farm and Home Science

Kenneth R. Stevens
Associate Professor of Bacteriology, Utah Agricultural Experiment Station

Food poisoning is a broad term which includes not only certain bacterial infections, but also conditions resulting from the consumption of naturally poisonous food substances: toadstools, poisonous fish, ergot-infected grain, and to the ingestion of foods containing certain chemicals. Food poisoning is usually associated with, and indicated by, acute gastrointestinal disturbances. Exceptions to this condition, however, are botulism poisoning which shows little, if any, gastrointestinal symptoms, and food allergy in which the food is wholesome but the consumer develops an abnormal reaction to it.

Since man has learned to preserve foods by scientific methods based upon principles, great changes have taken place in his manner of living. Fresh fruits, vegetables, and meats are produced and shipped fresh or processed to distant markets any season of the year. There is a somewhat popular belief that food poisoning is associated with food decay in such foodstuffs during transportation, handling, and shipping; but deterioration of foods does not necessarily give rise to the production of poisonous substances found in food poisoning.

About sixty years ago food poisoning was thought to be caused by the presence in food of poisonous substances called ptomaines, formed as a result of protein decomposition. Research work, however, has shown these compounds to be but weakly toxic. Also, it was found that ptomaines are not formed until foods have reached such advanced stages of decomposition that they are repulsive to the senses of taste and smell. Since food poisoning results from the eating of food which is usually sound in appearance, there is no basis to speak of ptomaine food poisoning.

The infectious type of food poisoning is that kind in which bacteria of the Salmonella group are transmitted by the food to man's body where they grow in

Reprinted by permission from Farm and Home Science, Logan, Utah, June, 1948

the intestines and produce disturbances similar to, though milder than, typhoid fever. This kind of poisoning is associated mostly with meat and meat products.

A group of persons developed food poisoning as a result of eating meat from an emergency-slaughtered cow. One person died and the same germ was isolated from his body as from the meat. Several men were poisoned from eating sausage. A meat inspector examined the suspected product and found it satisfactory in appearance, color, and odor. He and four other men ate some of the meat. All became ill within a few hours, and the inspector died on the sixth day. Laboratory studies showed a member of the Salmonella group present in the vital organs of the dead man and the same species of organism was isolated from a sample of the sausage.

Foods become contaminated with Salmonella by using meat from emergency-slaughtered animals; from carelessness on the part of healthy persons whose feces carry the germ; from rats and other rodents as well as flies which may carry the organism in and about slaughter houses and meat markets; from allowing good meat to come in contact with diseased meat; or from instruments and tools used on diseased meat which are not properly sterilized before being used on healthy meat.

The prevention of this type of food poisoning will be associated with the recognition and understanding of the above sources of contamination. Food inspection, health and cleanliness among human personnel, and proper conditions of food storage are among the most important items to observe.

In the toxic type of food poisoning, the organisms secrete a poisonous substance from their own bodies into the food. This occurs before the food is eaten and is responsible for the most common type of food poisoning. The symptoms appear quickly and the attack is of short duration. This type of poisoning is caused mostly by members of the Staphylococcus group of bacteria. These organisms are everywhere present and particularly on human skin and in the throat. They are able to grow in food without the food showing any signs of spoilage from the standpoint of appearance, taste, odor, or color; and yet the poisonous toxin may have been secreted and be present. Foods most responsible for this type of poisoning are meat, milk, pastries, puddings, gravies, especially when they have been left for a few hours at room temperature. This type of food poison-

ing accounts for large groups of individuals becoming ill after banquets, parties, and similar gatherings.

The prevention of this type of food poisoning may be effected by proper inspection of human personnel and the recognition that low temperatures inhibit the growth of the organism which secretes these toxic poisons. It is well to avoid holding prepared foods at room temperature even for a few hours' time prior to serving them.

Botulism poisoning is caused by the secreted poison produced during the growth of the botulism bacteria in improperly heated canned foods. These bacteria occur commonly in soils and are easily transmitted to foods by contact, as in the case of vegetables, and by dust on fruits and meat. No cases of botulism, however, have been traced to commercially canned foods since 1925. Home canned foods are still responsible for occasional outbreaks because some housewives fail to recognize the resistance of this organism in its spore form to heat. The spores of this organism are known to withstand a boiling temperature for six hours. The higher temperature obtained in a pressure cooker, in association with the periods of time recommended in government bulletins is essential to the destruction of the organism in the spore form. If foods are properly processed, there is no reason why any home canned food product should carry the botulism toxin. If one suspects a food substance, however, even though it shows no changes in appearance or odor, as may happen in the presence of botulism organisms, the food can be made safe for use by boiling it for twenty to thirty minutes, preferably with stirring.

The symptoms of botulism food poisoning usually appear in one or two days after eating the food, and are characterized by disturbances in vision, and difficulty in speaking, swallowing, and breathing.

There is no evidence of poisoining ever having been caused by molds growing on or in foods.

Chemical food poisoning is not common compared with bacterial types, but a few examples may be cited to indicate possibilities. Arsenic and lead poisoning, usually associated with the result of spraying programs, are of minor importance. Such types of poisoning are more likely to be associated with occupations in which these chemicals are used. Cadmium coated ice trays, pitchers, and other utensils have been responsible for cadmium food poisoning when acid foods such as lemonade, or home made punch come in contact with them. Fluoride

food poisoning is caused by the use of sodium fluoride, a white powder used as an insecticide, and often mistaken for baking powder, baking soda, or flour. Methyl chloride food poisoning happens when this substance is used as a refrigerant in home refrigerators and leaks develop in the system. This type of food poisoning is often mistaken for botulism poisoning, because of a similarity in symptoms. Tin poisoning is practically unknown, despite a common notion which people have that food spoils more quickly when standing in an open tin can than if removed from the can and placed in another type of container. Any spoilage occurring will be caused by bacteria and not by a reaction between the food and the tin coating on the sheet metal can.

Preventative measures for chemical food poisoning require a knowledge of the probable sources of the various chemicals which may be involved, and the exercising of extreme care in the use of products whose identity is not well known.

If the general fundamental principles associated with the prevention of food poisoning are properly practiced, there is little reason why poisoning should be a serious problem.

New Cattle-Killing Weed Spreads in South

There's a new cattle-killing weed on the loose, from Florida to Texas and Oklahoma. Its botanical name is "glottidium vesicarium." Farmers call it bladderpod, coffee bean weed, castlebean.

Last winter it killed at least 100 cattle in Oklahoma. Next winter it will kill many more, warns Dr. H. I. Featherly, Oklahoma A. & M. College botanist.

The weed grows 2 to 12 feet tall. Its leaves are feathery; its pods are fat and pointed, with an inside membrane or "bladder" within the outside hull. In the pod are two dark brown beans, shaped like small butterbeans. They are hard coated, may not sprout for a year or two.

There apparently is no remedy if a cow eats the beans. They seem to become poisonous only after frost, however, and lose their poison in storage.

Symptoms are bowel upsets, rough coats, trembling legs.

Hogs won't eat the beans, and apparently sheep pass it up, too. Chickens have been killed in experiments to test the poison.

The plant—it's a legume—is an annual, and probably can be controlled by mowing before it sets its seed.

—Farm Journal

Can You Tell when Crops Need Feeding?

Condensed from Farm Journal

Z. H. Beers
Middle West Soil Improvement Committee

WHEN your crops are hungry, they will do their best to tell you. By their leaf color, their stalks, and the size and shape of their grain, your crops "talk."

It will pay you to learn their language, and act on what they tell you.

Starvation signs are harder to read on some crops than others. Small grains, for example, don't tell very much. But your corn will carry signs that are clear and distinct. And when these signs show on corn you can safely bet that the small grains aren't getting the plant food they need for top yields; neither are pasture and hay crops.

Nitrogen hunger in corn shows up in the middle of the lower leaves. The newer leaves at the top rob the older ones at the bottom when there isn't enough nitrogen to go around. They turn yellow. Yellowing starts at the tip, and runs down the middle of the leaf, finally covering the entire surface.

You've probably had corn at tasseling time with the lower leaves yellow and dead. That's nitrogen shortage, not drought. If those plants had suffered only from lack of water, the leaves would have dried *green,* not yellow.

Ears on nitrogen-hungry corn are small, perhaps nubbins, but still well filled.

Nitrogen hunger in corn shows up any time after the crop is up until it's mature. Very small plants turn a yellowish-green. They are spindling and weak

That purple color you see in corn is usually, but not always, a sign of phosphorus starvation. Some strains of corn can be starved for phosphorus, and still not show the color change. It depends on the breeding.

Generally such plants will be small and spindling, for phosphorus is needed for root growth. Such plants get off to a slow start, and never do catch up.

A phosphorus-starved ear is curled and bent, because rows of kernels are not fertilized to grow and fill out. The silks come out too late.

Reprinted by permission from Farm Journal and Farmer's Wife, Philadelphia, Pa., June, 1948

You can't do anything about phosphorus this year, but you can see in '48 what you'll need to do in '49.

That scorched look on the *edges* of the lower leaves is caused by a lack of potash. Like nitrogen, potash is moved from place to place in the plant. If there isn't enough to go around, the younger leaves rob the older ones.

But unlike nitrogen, the potash is taken first from the *edges* of the lower leaves. The mid-rib may still be green while the edges are scorched and dying.

Potash hunger signs will show up any time after the corn is up, until it is mature. Then you can see it in the ears. Without potash, the plant can't make starch to fill out the kernels. So the kernels may be hardly more than shells. The ears are peaked, pointed and chaffy. The cob is weak and limber.

Seeing these signs in your fields is one thing. Finding and correcting the cause is another. Soil tests will give you a good inventory of the phosphorus and potash now in your soils. There is still no quick, reliable test for nitrogen. You can, though, figure the nitrogen you are putting back by turning under legumes, straw, and manure. You must add the difference between the "inventory" and crop needs through fertilizers.

But just fertilizer isn't enough. It's a good idea to probe your soils and see if they are loose and mellow—if they have the structure and tilth for good root growth. Tubes are now being made with which you can "plug" your soils as you would a watermelon.

The only way to put your soil in good shape is through the regular use of thick stands of well-fed legumes and grasses. Alfalfa and sweet clover are probably the best. Their tap roots also push organic matter deep into the soil.

You can buy the plant food your crops need but you can't buy good soil structure. You have to grow that.

Now, back to the corn field and those hunger signs. Here's what to do: Test your soil and find out how much plant food it needs. Lime so that legumes can be profitably grown. Settle on a rotation that will build and maintain a grainy, mellow soil, and add nitrogen. Use the needed fertilizer to get the rotation started. Then figure the plant food sold off the farm, and balance it with fertilizers carrying nitrogen, phosphorus, and potash. Above all, use every conservation trick to keep your soil at home, and to save water.

You have to spend money on your soil to make it do these things. But it's an investment that will pay off.

Makes Broilers Grow Faster

Connecticut poultrymen have learned how to grow bigger broilers on less feed. They are turning out birds that average 3.75 pounds at 12 weeks. That is recognized as unusual by broiler men who understand the careful feeding necessary to grow birds to 3 pounds in 85 days.

Most-welcome news in these days of high grain prices is that the Connecticut poultrymen are producing their heavy broilers on 3.33 pounds of feed a pound of grain. Pushing birds to such weights in 12 weeks often takes 5 pounds of feed for a pound of grain.

Another good angle to this new broiler formula is that its use is disproving the idea that chicks can't grow or feather on a high corn diet. High percentages of corn in broiler feed usually cause trouble. But corn is the only grain in the Connecticut ration and it makes up 69 percent of the mixture.

Niacin, or nicotinic acid, one of the parts of the B-Complex vitamin, is the magic material that permits the heavy use of corn. H. M. Scott, who was head of the poultry division at Connecticut station, traced the effect to nicotinic acid by gradual elimination of various vitamins from high corn rations.

The ration was tested on thousands of broilers of every breed grown in the state. Males from Rhode Island Red-Barred Rock mating weighed 3.7 pounds at 12 weeks and 4.6 pounds at 14 weeks. At 14 weeks they had consumed 3.5 pounds of feed to a pound of grain.

Scott tested the ration for 3 years before it was released to Connecticut farmers. Commercial broiler producers have found the formula more efficient and economical than standard feeds. Fortunately for growers, the nicotinic acid requirement in the mixture costs only a few cents a ton of feed.

The ration contains about 21 percent protein, made up chiefly of soybean meal, fishmeal, livermeal and meat scraps. Alfalfa meal is reduced to 1 pound, compared with 5 pounds in the ordinary broiler ration. Scott, who is now in charge of poultry investigation at Illinois, says corn and wheat will do as well as corn alone in the ration. Yellow corn is desirable because it contains enough vitamin A for broiler needs.

—Capper's Farmer

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*Shorts.

Among The New Books

Malabar Farm—By Louis Bromfield, Author, Farmer, Conservationist. Harper & Bros. $3.75.

The Business of Farming—By Herrell DeGraff, Prof. Agri. Economics, Cornell Univ., and Ladd Haysted, Farm Journalist. Univ. of Okla. Press. $3.00.

Successful Part-time Farming—By Hadyn S. Pearson, Farm Specialist. McGraw-Hill Book Co., Inc. $3.00.

The Farmer's Handbook—By John M. White, Farmer, County Agent, Agricultural Adviser. Univ. of Okla. Press. $4.95.

Countryman's Companion—Edited by David B. Greenberg, Author and Farmer; introduction by Donald Culross Peattie. Harper & Bros. $3.00.

Furrow's End—An Anthology of Great Farm Stories. Edited by David B. Greenberg; introduction by Louis Bromfield. Greenberg, Publisher. $3.00.

The Earth's Face and Human Destiny—By Ehrenfried Pfeiffer, Director Bio-chemical Research Laboratory, Dornach, Switzerland; foreword by Sir John Stapledon. Rodale Press. $2.75.

The Earth's Green Carpet—By Louise E. Howard, Agricultural Adviser. Rodale Press. $3.00.

Wild Flower Guide—By Edgar T. Wherry, Prof. of Botany, Univ. of Pennsylvania. Doubleday & Co., Inc. $3.00.

Dwarf Fruit Trees—By Lawrence Southwick. Edited by Ed Robinson, "Have-More Plan." The Macmillan Co. $2.50.

Starting Right With Milk Goats—By Helen Walsh. Edited by Ed Robinson, "Have-More Plan." The Macmillan Co. $3.00.

Raising Livestock—By Walter H. Peters, Chief, Div. of Animal and Poultry Husbandry, University of Minnesota, and George P. Deyoe, Prof. of Agricultural Education, Univ. of Illinois. McGraw-Hill Book Co., Inc. $3.50

"THE COUNTY AGENT"

"He is a man of many qualities. He is a doctor of the fields. He hears the problems and the woes of many and prescribes remedies.

He is an architect among rural people. His is a duty of building character among youth, unity among adults. He points the way for new wealth to be bought from the soil they till.

He is a diplomat and an ambassador. He carries new information from the great centers of learning to his people and their problems to these centers.

He is a scientist. He must know a multitude of technical facts and how best to fit them into practice in his community.

He is a shepherd. His flock includes all ages, races, creeds, and habits. His mission is to lead them always to greener pastures and better living.

—Journal of the American Society of Farm Managers and Rural Appraisers